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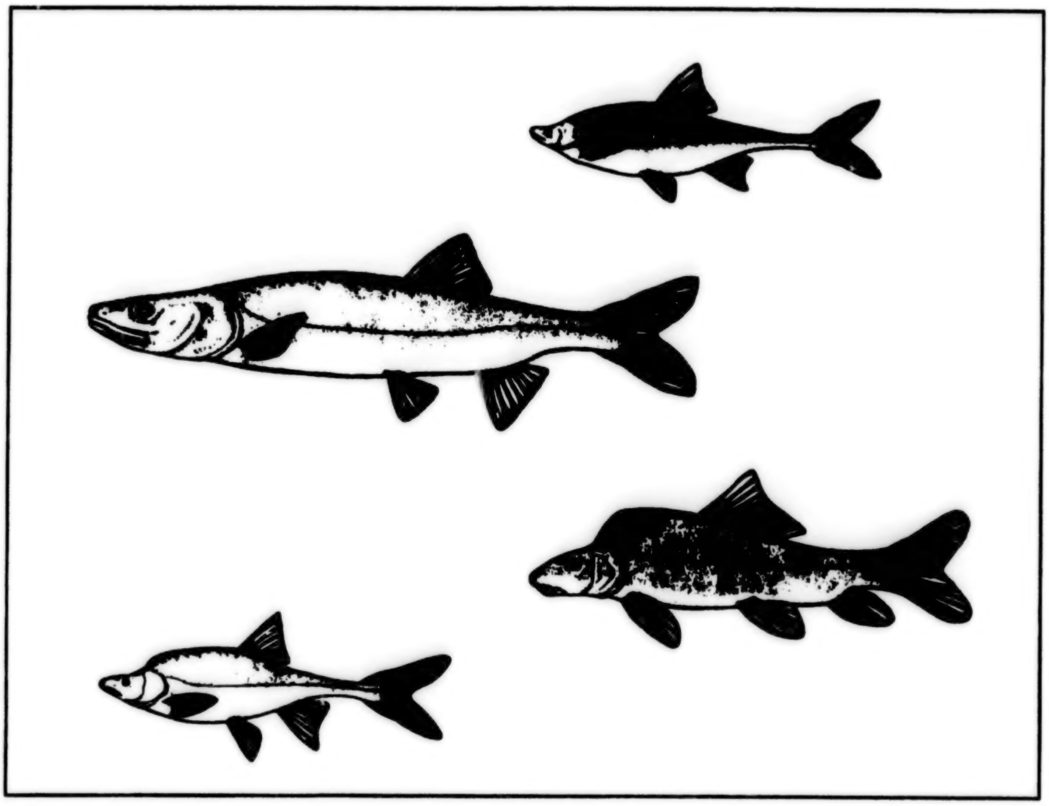

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Table II-15-GE-7b. Colorado River Basin - National Economic Sectoral Results . . . . . [illegible]
Table II-15-GE-8a. National Economic (CGE) - Present and Annualized Values . . . . . [illegible]
Table II-15-GE-8b. National Economic (CGE) - Present and Annualized Values . . . . . [illegible]
Table II-15-GE-9. Changes in Consumer and Producer Surplus . . . . . [illegible]

Volume II

Chapter 1: Overview of Analysis

A. Overview

This volume describes the methods and results of an analysis of the combined economic impacts of listing and critical habitat designation for four endangered Colorado River fishes the razorback sucker, the Colorado squawfish, the humpback chub, and the bonytail. Both species listing and designating critical habitat provide protection for endangered fish and form the basis for recovery efforts [illegible] by the Endangered Species Act (Act). The Act also requires consideration of economic impacts in designating critical habitat, but such considerations are not allowable as criteria for species listing. As a result, it is necessary to separate the economic consequences of the two forms of protection. The incremental impacts of critical habitat designation are also computed and presented.

The approach taken in this economic analysis of proposed critical habitat designations for endangered Colorado River fishes was first to estimate the combined economic effects of listing and critical habitat designation, and then to allocate the effects to the two forms of protection. This volume of the report describes the combined economic analysis and the allocation process.

The process for designating critical habitat for the razorback sucker, the bonytail, the humpback chub, and the Colorado squawfish (referred to collectively as Colorado River endangered fishes in this document) consists of three major steps. The first step is to complete a biologically based determination of potential critical habitat areas. This step provides an inventory of areas needed for the survival and recovery of the species. For the razorback sucker, the biological determination was based on the primary constituent elements and additional selection criteria determined by United States Fish and Wildlife Service (USFWS). These constituent elements and additional selection criteria were then applied throughout the historic range of the razorback sucker. For the bonytail, the humpback chub, and the Colorado squawfish, the biological determination was based on the primary constituent elements and existing recovery plans for these species.

The second step, which this volume is primarily concerned with, is to determine the potential economic impacts of the species listing and proposed critical habitat designations. The final step is to decide which areas, if any, should be excluded based upon economic or other relevant impacts and to determine costs and benefits associated with the final designation. This final step will be addressed after public comments have been received.

The study is complex for several reasons. First, the various management practices and flow requirements needed to recover the four fishes were specified for each critical habitat reach in the Colorado River Basin. Second, a study was made of the multitude of direct economic effects due to listing and designation in a seven-State area. Finally, a set of economic models to project the overall (direct and indirect) economic impacts of managing portions of the Colorado River for the four endangered fishes were developed.

The links between the biological requirements and the economic model had to be carefully defined. Proper development of the links between the biological requirements and the economics was critical to the evaluation of the impacts of the proposed critical habitat designation. Only if these links were clearly specified could a dollar value of the impacts of designating critical habitat be determined.

The economic analysis proceeded along three principal lines. First, the economics team worked with USFWS biologists to identify the ongoing and future management practices that potentially may be altered in order to ensure that the fishes will be protected. This has included the delineation of flow-related activities such as the alteration of hydroelectric generation and nonflow-related activities such as alterations in mining and oil production activities.

Second, the economic sectors that may be affected based upon the potential alteration of management activities were identified. These include the agricultural, hydroelectric, mining/gas/oil, recreation, municipal, and industrial sectors. In addressing the potential alteration of management activities such as water use by activity, the economic analyses do not address Colorado River Compact allocations. Compact issues such as tribal water rights, intra-State and inter-State transfers and water marketing are beyond the scope of the analyses. The USFWS has always worked within existing State water law in obtaining and legally protecting instream flow for fishes.

Third, the economic analysis involved the use of a series of model stages. Since there were no existing economic models capable of making such assessments, models were constructed specifically for this project. For each of the seven States an input-output model with 20 specific economic sectors, was developed. Using the same 20 sectors, an input-output model for the basin as a whole was developed. In addition, a computable general equilibrium model, with 19 economic sectors, was developed. These modeling frameworks were chosen after discussions with USFWS biologists regarding the potential listing and designation effects of the endangered fishes.

The set of input-output models employed in this project is part of a staged investigation wherein each stage is intended to address particular issues. The initial stage is a separate model for each of the States in the affected region: Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. This stage focuses on the impacts that may be generated by proposed critical habitat designations within each individual State.

Impacts in a given State may generate responses in neighboring States, and thus it is necessary to investigate potential offsetting impacts in the larger regions. For this reason, a second stage was undertaken in which an input-output model was constructed for the entire region (all seven States). This model stage computes regional economic impacts at the State and Colorado Basin level.

The third stage of the analysis involved developing a computable general equilibrium model (CGE) of the basin-wide economy. The CGE approach provides a more comprehensive assessment of economic effects than an input-output model. The model captures the economic interactions of consumers, the production sectors, and government sectors. The CGE model allows for analysis of resource reallocation proposals (e.g., changes in river flows as represented by increased or decreased hydroelectric generation) in a manner such that the net national efficiency effects are estimated.

All model stages of the economic impact analysis employ the same set of scenario projections. The without fish economic scenario consists of a projection of the levels of economic activity that would occur in the region if no listing and/or critical habitat actions were undertaken. This projection covers the period through the year 2020. The biological opinions concerning the endangered fishes indicated that recovery may take years. The with fish scenario economic projection incorporates potential action that may be taken on behalf of the endangered fishes. These scenarios allow a comparison of the without and with fish scenarios to obtain the net economic impacts associated with species listing and proposed critical habitat.

B. Plan of the Volume

Chapter II-2 discusses the geography of the Colorado River region and provides an overview of the current economic structure and the development of the economy of this region since 1950. Chapters II-3 and II-4 discuss the individual State economies. This information forms the foundation from which the economic impacts were calculated for the State input-output models. Chapter II-5 presents information regarding the listing history and location of the proposed critical habitat areas for the four endangered fishes. Chapter II-6 describes the methodology utilized to assess changes in the hydrology of the river system.

Chapter II-7 presents the conceptual framework of the input-output models and the computable general equilibrium model. Chapter II-8 discusses the input data used for evaluating the economic impacts, the methods used for aggregating the economic sectors, and the input data for the model stages. Chapters II-9 and II-10 present estimates of direct changes in economic activities resulting from listing and the designation of critical habitat for the Upper and Lower Basin States. These chapters combine the overall data collection effort into a format that is suitable for use with the modeling frameworks.

Chapter II-11 presents the individual regional- and State-level results associated with the economic impacts, and Chapter II-12 presents the regional economic impacts for the Colorado River Basin as a whole. Chapter II-13 presents the national efficiency impacts stemming from the computable general equilibrium model results. Chapter II-14 presents the method for disaggregating species listing impacts from critical habitat impacts, and Chapter II-15 presents the results for the four endangered fishes of the incremental impacts of proposed critical habitat designation.

Volume II

Chapter 2: The Study Region: Geography, Biodiversity Values and Overview of the Basin Economy

A. Geography of the Colorado River Basin

Headwaters of the Basin originate in the Rocky, Wasatch, and San Juan Mountains of Colorado, Wyoming, Utah, and New Mexico. The Basin drains approximately 242,000 square miles of the United States and about 2,000 square miles of Mexico. The portion in the United States includes the States of Arizona, California, Colorado, Utah, Nevada, New Mexico, and Wyoming. To facilitate management of the water resources, the Basin was divided into Upper and Lower Basins by agreement between the seven Basin States in the 1922 Colorado River Compact. The Upper Basin begins at the headwaters, and ends at Lee's Ferry, Arizona (16 miles below Glen Canyon Dam). Major drainages in the Upper Basin include the Upper Colorado, Green, Gunnison, and San Juan rivers. The Lower Basin begins at Lee's Ferry, and ends at the United States/Mexico border. Major drainages in the Lower Basin include the Lower Colorado, Little Colorado, Virgin, and Gila rivers. The latter also includes the Salt and Verde river drainages.

The sheer size of the Basin in conjunction with the variety of habitats, meant that a variety of different fish species could develop and the overall fish fauna would differ depending on the location in the Basin. Changes in drainage structure due to geological factors also contributed to the creation of new, isolated fish species that added to the diversity of the Basin. The riparian and wetland areas along the streams and rivers provided a habitat for invertebrates, amphibians, reptiles, birds and mammals. The riparian forests and wetland vegetation provided forage and resting areas for migratory waterfowl and songbirds.

Until recent times, the Basin supported a fish fauna unique in North America. Of the 36 fish species native to the Basin, 64 percent were not found in other river basins. Only eight fish species are common to both the Upper and Lower Basin. Of these, four are listed as endangered and two are candidates for listing. The large geographical extent of the Basin also supports a variety of habitats; from the Rocky Mountains to the desert southwest.

B. Current Status of the Colorado River Basin

The Basin biodiversity in the past relative to the current biodiversity is central to the issue of proposing the designation of critical habitat. Over the last century, the physical characteristics of the Colorado River Basin have been altered. Historically, barriers to the endangered fishes migratory habits in the basin were predominately natural rapids and swift turbulent waters. While these natural barriers may have impeded fish migration, they were not absolute impediments. The 1902 Reclamation Act lead to major dam development in the Lower Basin. These dams and diversions have fragmented the river systems and obstructed the fishes ability to migrate. This has resulted in substantial physical changes in the Basin.

Coupled with the development of diversions and dams has been the increased consumptive use of water from the river basin. Developed irrigated land in the Basin is now in excess of 2.1 million acres. the steady growth of urban areas in the Basin has also contributed to increases in consumptive uses. These consumptive uses have lead to major depletions in the river. These depletions have thus changed the nature of the Basin. Other changes in the physical nature of the basin have come through activities that generate contaminants, mining activities, channelization, recreation activities, and home sites along the river and the introduction of nonnative fishes.

C. Values Associated with the Preservation of the Basin

In evaluating the proposed designation of critical habitat, ideally a formal efficiency base benefit-cost analysis would be undertaken. The specification of the benefits and costs requires that the market and nonmarket benefits and costs are known. It is the nonmarket benefits of preventing further deterioration of the Colorado River Basin or improvements in the physical nature of the Basin that are difficult to quantify. Further, the value in and of itself of preservation of the four endangered species is unknown.

In general, these endangered species are not traded through markets and the nonmarket value of the species as represented in the overall value of the ecosystem is not directly observable. The value of all of the Colorado River Basin resource flows would need to be completely known to in order to apply a efficiency test of the present value of net benefits (market and nonmarket) of designating critical habitat.

The legislative history of the Endangered Species Act of 1973 is indicative of the "value" placed by Congress on endangered species. Specifically, it was believed by many that the "value" was incalculable and invaluable.[1] This effectively assigns an infinite value to the species.

The values of individual or groups of endangered species is complicated by the fact that the species cannot be separated from the value of the ecosystem. That is, the value of the fishes is incorporated in the overall value of the biodiversity of the ecosystem. In order to place a value on the overall ecosystem, the genetic diversity, species diversity, ecosystem diversity (eg. variety of communities and habitats) and the landscape biodiversity (eg. the spatial heterogeneity of ecosystems) must be specified.

For the case at hand, this would be the physical situation prior to the designation of critical habitat. Then, depending upon the activities necessary for the recovery of the species, the biodiversity that would result from the activities undertaken would need to be specified. The value of the ecosystem is then associated with the willingness, of society, to pay for the potential incremental change in the biodiversity of the Colorado River Basin ecosystem.

Techniques exist for the determination of nonmarket goods. However, a valuation project of an ecosystem of the scale involved in this study has never been undertaken. Effectively, such a study would have to specify all of the existing resource flows that exist, and the level of the eventual level of resource flows.

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[1] During critical habitat designation, consideration of benefits and costs can occur when "economic and other relevant impacts" are considered in the process of final determination.

There is an ongoing study that is attempting a valuation of the changes in the resource flows on a subregion of the Colorado River system by HBRS, Inc[2]. The study is funded through the Bureau of Reclamation and is part of the overall Glen Canyon Environmental Studies (GCES). This study is in the early stages of development.

This effort reported upon herein was not afforded the time or resources to undertake a similar study, especially in light of the Court order mandating the USFWS complete the critical habitat designation as expeditiously as possible.

D. Overview of the Colorado River Basin Economy

1. Structure of Economic Activity

As indicated above, the requirements of a study for determining the nonmarket benefits of critical habitat designation would require a description of the current status and some future projected status. This study focuses on the market impacts in the Basin and a brief description of the structure of the economy of the Colorado River Basin, as it existed in 1989, is provided. Later in this section, a history of the Basin economy is also provided and special attention is devoted to historical developments that affect the endangered fishes.

For the purposes of the economic analysis the economy of the Colorado River Basin region was organized into 20 industrial sectors. This was accomplished by aggregating the 528 sectors in the economic data base. The aggregation procedure is described in Chapters II-7 and II-8. The 20 sectors are reported in Table II-2-1.

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[2] HBRS, Inc. 585 Science Drive, Suite A, Madison, WI 53711-1060

Table II-2-1. Industrial Sectors Represented in the I-O Model
20 Industry Categories for Input-Output Models

Sector	Industry
1	Livestock
2	Other Crops
3	Livestock Feed
4	Miscellaneous Agriculture
5	Non-Petroleum Mining
6	Petroleum and Natural Gas Mining
7	Construction
8	Combined Manufacturing
9	Food Products
10	Wood Products
11	Petroleum and Coal Products
12	Transportation, Communication, and Utilities
13	Recreational Services
14	Electric Power
15	Wholesale and Retail Trade
16	Finance, Insurance, and Real Estate
17	Household and Business Services
18	Local Amusements
19	Health, Education, and Social Services
20	Government Industries

Note: Sectors 19 and 20 were combined for the CGE Model. Thus, the CGE Model has 19 sectors.

a. Output Levels

The total industrial output for the seven States that comprise the Colorado River Basin study area is dominated by the combined manufacturing and the finance, insurance, and real estate sectors with, respectively, 18.4 percent and 14.9 percent of total output. The petroleum and gas production sector generates 2.4 percent of output while the recreation services sector produces 7.7 percent of the total output. The electric power production sector is about 1.5 percent of the total output. The combined agricultural sectors are responsible for 3.0 percent of the total output. (See Figure II-2-1.)

b. Employment

The largest single employment sector is the government industry sector with 16.9 percent of total employment. The combined manufacturing sector is only slightly behind this with 15.4 percent of total employment within the Colorado River Basin States. The recreation services sector is also a very significant part of total employment at 10.5 percent. The electric power production sector is around 0.5 percent of the total employment. Combined agricultural employment is approximately 4.3 percent of total employment. The petroleum and gas production sector accounts for about 0.2 percent of employment. (See Figure II-2-2.)

c. Earnings

The combined manufacturing and the government industry sectors are respectively responsible for 18.6 percent and 18.4 percent of total earnings. The recreation services sector accounts for 6.9 percent of total earnings. The electric power production sector is about 0.6 percent of the total earnings. For the agricultural sectors, the livestock feed sector is 0.04 percent of earnings, and other crops sector is around 0.45 percent of earnings. All agricultural sectors are responsible for approximately 1.3 percent of total earnings. The petroleum and gas production sector delivers about 0.5 percent of total earnings for the Colorado River Basin States. (See Figure II-2-3.)

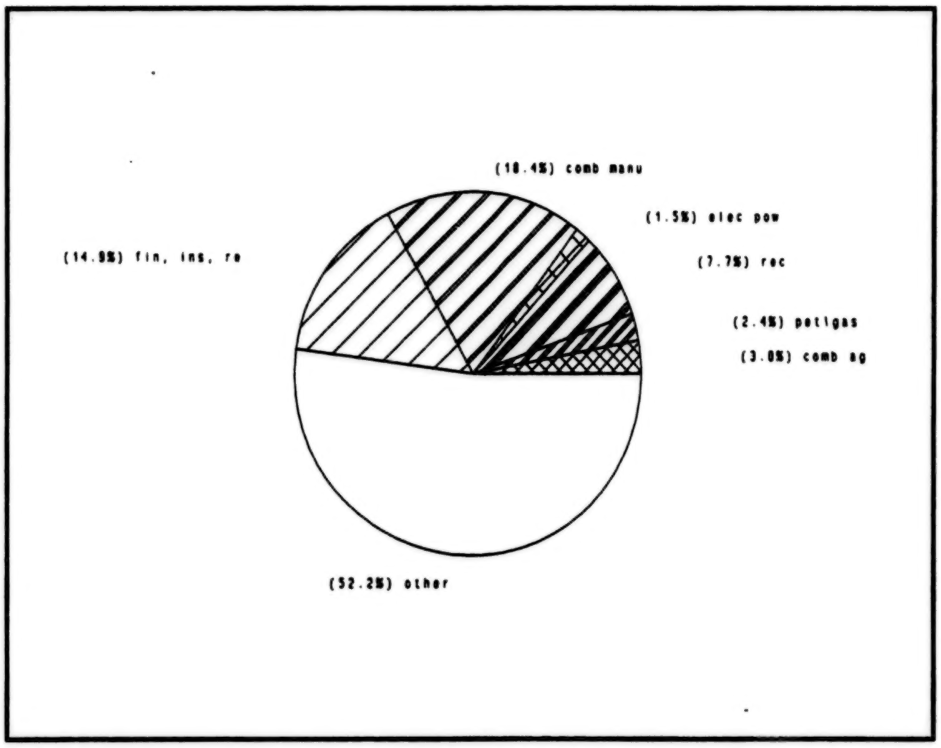

Figure II-2-1. Output (1989) - Colorado River Basin

Note: "Other" refers to the total comprised of those sectors not being specifically named in the chart.

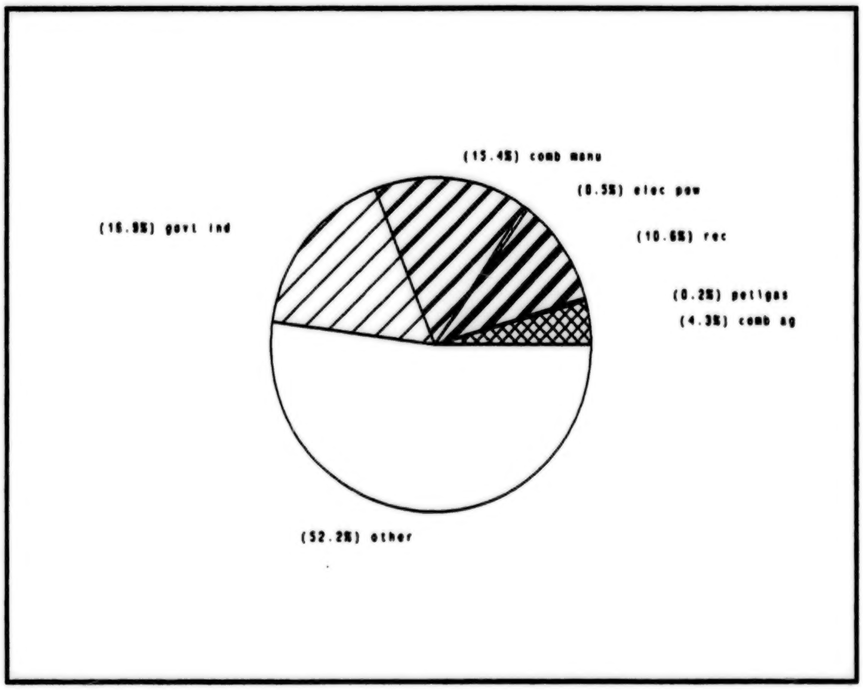

Figure II-2-2. Employment (1989) - Colorado River Basin

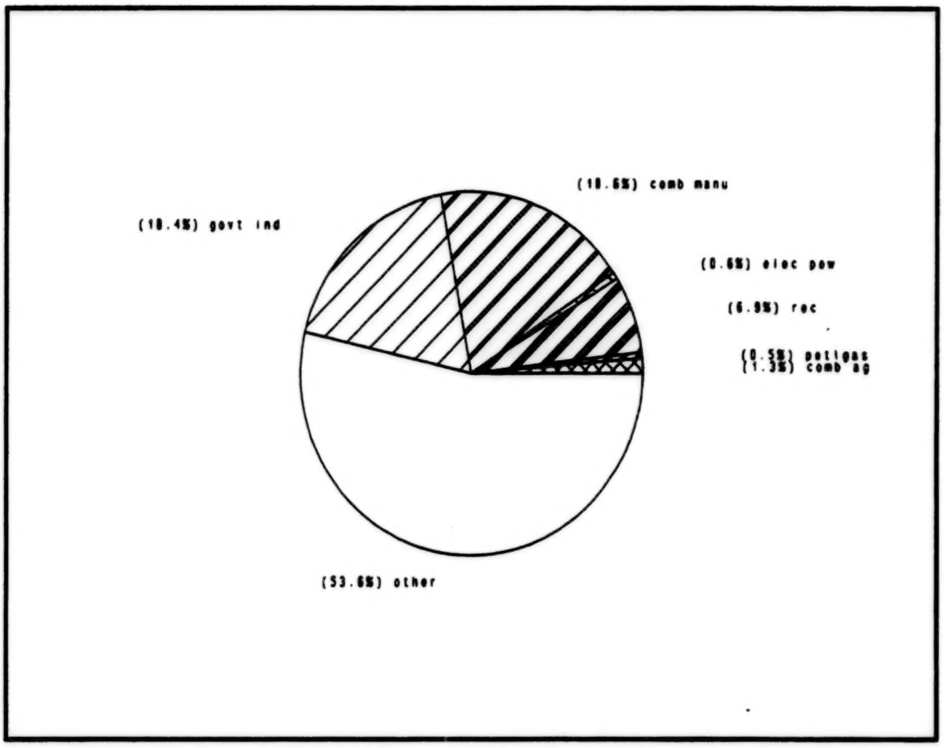

Figure II-2-3. Earnings (1989) - Colorado River Basin

d. Indirect Business Tax

The finance, insurance, and real estate sector is responsible for 42.9 percent of the indirect business tax for the Colorado River Basin States. The wholesale and retail trade sector has 17 percent of the indirect business tax. The recreation services sector pays 7.9 percent of the indirect business tax. The livestock feed sector is associated with approximately 0.16 percent of the indirect business tax. The other crops sector is responsible for 0.33 percent of the indirect business tax. Total agricultural sectors are 1.2 percent of the indirect business tax. The electric power sector is responsible for 1.5 percent of the indirect business tax. The petroleum and gas production sector is associated with 6.4 percent of indirect business taxes. (See Figure II-2-4.)

e. Personal Income Tax

The personal income tax is dominated by employees of the combined manufacturing and the government industry sectors with 18.6 percent and 18.4 percent respectively. The recreation services sector is about 6.9 percent of personal income tax. The livestock feed sector is associated with 0.04 percent of personal income tax. The other crops sector is responsible for about 0.45 percent of personal income tax. All agricultural sectors are associated with about 1.3 percent of all personal income tax. The electric power production sector is around 0.6 percent of total personal income tax. The petroleum and gas production sector is 0.5 percent of personal income tax. (See Figure II-2-5.)

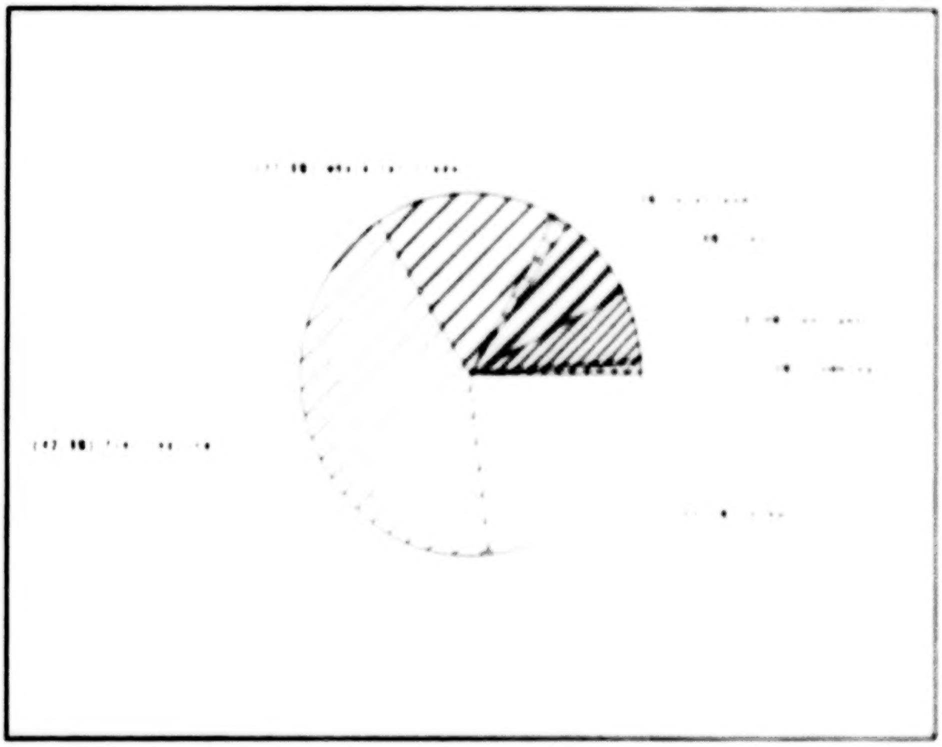

Figure II-2-4. Indirect Business Tax (1989) - Colorado River Basin

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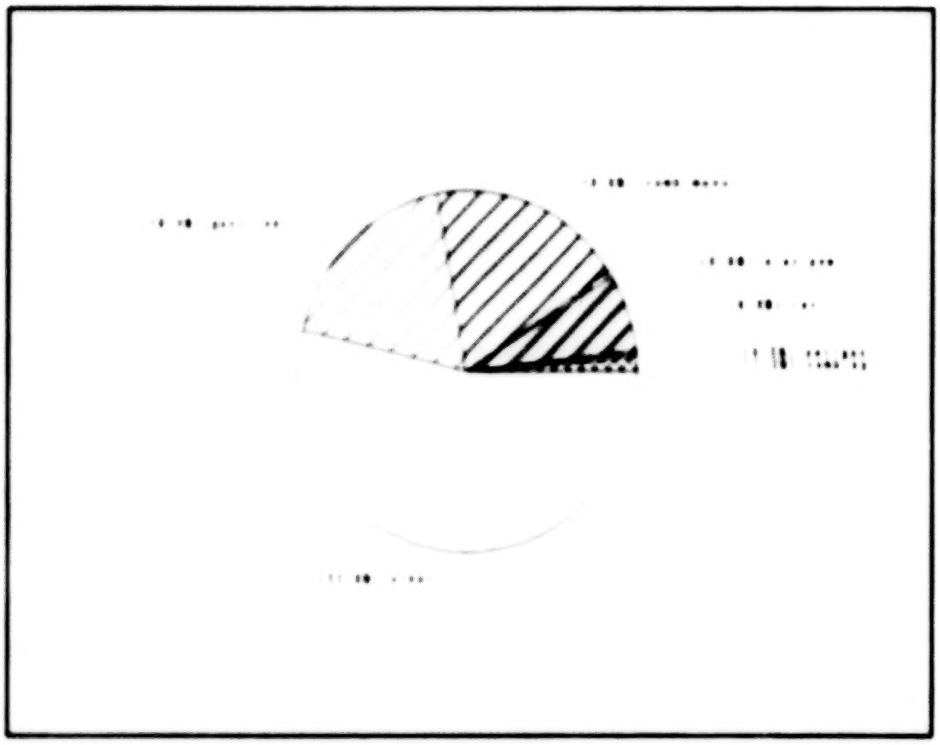

Figure II-2-5. Personal Income Tax (1989) - Colorado River Basin

2. Historical Developments in the Colorado River Basin States

The most significant economic development affecting the endangered fishes has been the rapid growth of population and urbanization since the turn of the century. In each of the seven States there has been a steady increase in the level of urbanization since 1950 (see Table II-2-2). This growth has been marked in the case of New Mexico, Colorado, Utah, and Arizona. The fraction of the population of New Mexico living in urban areas in 1950 was 50.2 percent. By 1990, this had increased to 73.0 percent. In Colorado the increase was from 62.7 percent in 1950 to 82.4 percent in 1990. Similar patterns are observed for Arizona and Utah. This population growth and shift has led to increased demands for water and for electric power. Municipal and industrial uses of water have increased since 1950.

3. The Colorado River Basin States Economy Relative to the National Economy

The Colorado River Basin region constitutes a considerable fraction of the U.S. economy. In 1989, the total employment in the Basin represented approximately 18 percent of the total employment in the U.S. economy. Labor earnings in the region comprised approximately 16.5 percent of the national total for 1989. Finally, gross regional output amounted to approximately 13 percent of the U.S. total.

4. Economic Projections Over Time (1989-2020)

The growth projections are obtained by applying the regional employment projections of the Bureau of Economic Analysis (BEA) within the input-output models. The methodology is described in Chapter II-8. For most sectors, the BEA projects employment to decline over the period 2010 through 2020. Some of the decline is likely due to structural changes in the economy, and some is due to shifting regional economic patterns. For the region as a whole, there is a slowing of growth of total output by the end of the study period.

Table II-2-2. Urbanization in the Colorado River Basin States
Percent of Population in Urban Centers

	Year				
State	**1950**	**1960**	**1970**	**1980**	**1990**
Arizona	55.5%	74.5%	79.6%	83.8%	87.5%
California	80.7%	86.4%	90.9%	91.3%	92.6%
Colorado	62.7%	73.7%	78.5%	80.6%	82.4%
New Mexico	50.2%	65.9%	69.8%	72.1%	73.0%
Nevada	57.2%	70.4%	80.9%	85.3%	88.3%
Utah	65.3%	74.9%	80.4%	84.4%	87.0%
Wyoming	49.8%	56.8%	60.5%	62.7%	65.0%

Total output is projected to increase in the region by 22 percent from 1989 through 2020. The change in employment over the study period is projected to be a positive 26 percent. The total changes in earnings between 1989 and 2020 is a positive 24 percent. The total changes in indirect business taxes between 1989 and 2020 is projected to be 24 percent. The total changes in personal income taxes between 1989 and 2020 is projected to be 24 percent.

Volume II

Chapter 3: Upper Basin State Economies[3]

A. State of Colorado

1. Structure of Economic Activity

a. Output Levels

The economy of the State of Colorado is dominated by two sectors, as measured by output: the combined manufacturing sector (17.9 percent) and the finance, insurance, and real estate sector (14 percent). Other major sectors are the recreation services sector, at 8.3 percent of total output, and the electric power production sector, at 1.8 percent of total output. For the agricultural sectors, the livestock feed sector is slightly over 1 percent of output, and the other crops sector accounts for about 0.67 percent of output. All agricultural sectors are responsible for 4.9 percent of the total output. The petroleum and gas production sector delivers about 2.7 percent of the total output. (See Figure II-3-CO-1.)

b. Employment Levels

There are several sectors that dominate employment. The wholesale and retail trade sector accounts for 14.6 percent, and the combined manufacturing sector is 13.9 percent of total employment. Another major employer is the recreation sector at 11.9 percent of the total employment. The electric power production sector accounts for about 0.5 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.56 percent of employment, and the other crops sector is around 0.95 percent of employment. All agricultural sectors are responsible for approximately 4.1 percent of total employment. The petroleum and gas production sector accounts for 0.2 percent of total employment. (See Figure II-3-CO-2.)

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[3] In the following sections, the activity for each of the Upper Basin States in the Colorado River Basin are presented for 1989. Projections through the year 2020 are presented in Chapter II-11 when the State-level impacts are discussed.

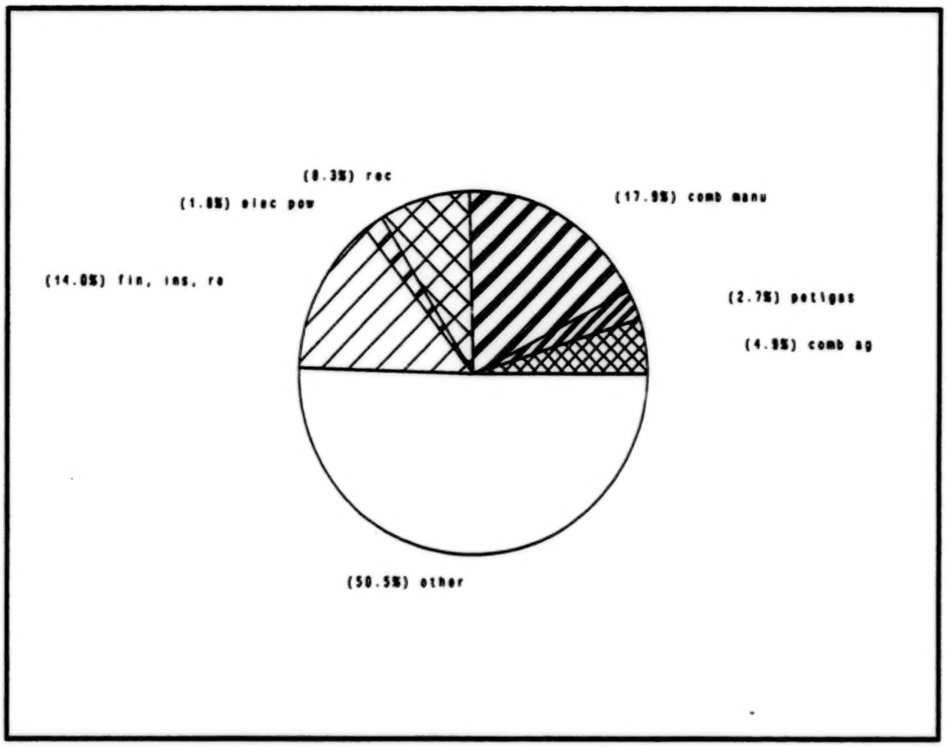

Figure II-3-CO-1. Output (1989) - Colorado

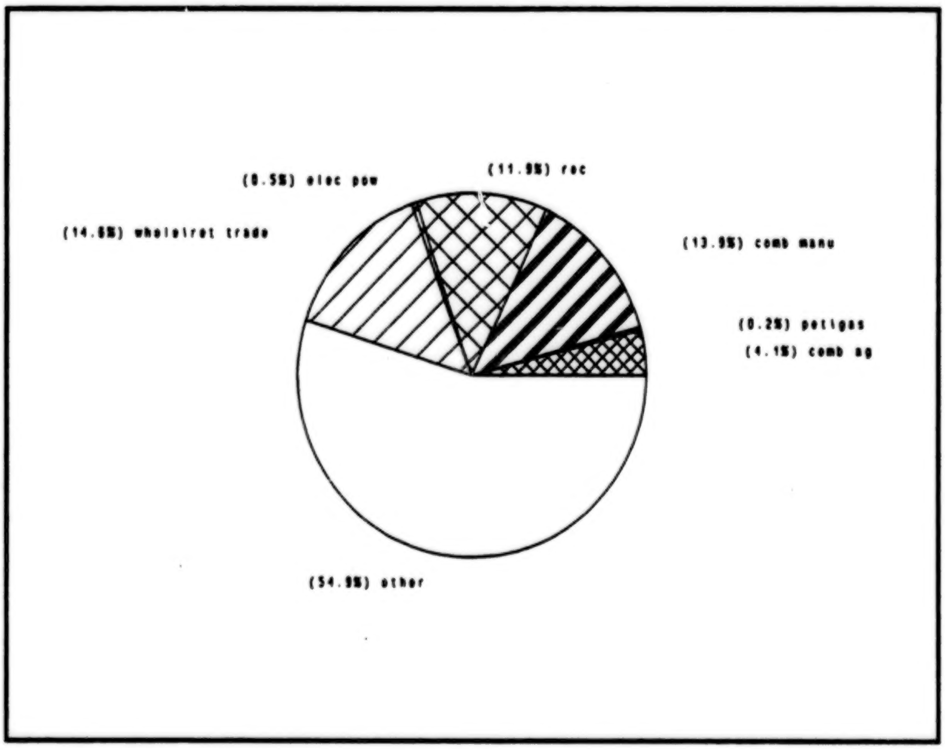

Figure II-3-CO-2. Employment (1989) - Colorado

c. Earnings

The combined manufacturing sectors and the government industry sectors are responsible for 18.6 percent and 17.9 percent of total earnings. The recreation services sector is 7.6 percent of total earnings. The electric power production sector is almost 0.8 percent of the total earnings. Within the agricultural sectors, the livestock feed sector is 0.11 percent of earnings, and the other crops sector is around 0.17 percent of earnings. Taken as a whole, the agricultural sectors are responsible for approximately 1.3 percent of total earnings. Petroleum and gas production sector is at 0.6 percent of total earnings. (See Figure II-3-CO-3.)

d. Indirect Business Tax Levels

The finance, insurance, and real estate sector is responsible for 37.3 percent of the indirect business tax generated in the State of Colorado. The wholesale and retail trade sector is responsible for 16.2 percent of the indirect business tax. The recreation services sector pays 8.2 percent of the indirect business tax. The livestock feed sector is associated with approximately 0.44 percent of the indirect business tax. The other crops sector is responsible for 0.26 percent of the indirect business tax. Total agricultural sectors generate 2.1 percent of the indirect business tax. The petroleum and gas production sector is associated with 6.7 percent of total indirect business tax. Electrical power is responsible for 1.8 percent of indirect business taxes for Colorado. (See Figure II-3-CO-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the combined manufacturing with 18.6 percent. The government industries sector constitues a 17.9 percent share of the personal income tax collections. The recreation services sector is about 7.6 percent of personal income tax. The livestock feed sector is associated with 0.11 percent of personal income tax. The other crops sector is responsible for 0.17 percent of personal income tax. All agricultural sectors are associated with about 1.3 percent of all personal income tax. The electric power production yields 0.8 percent of total personal income

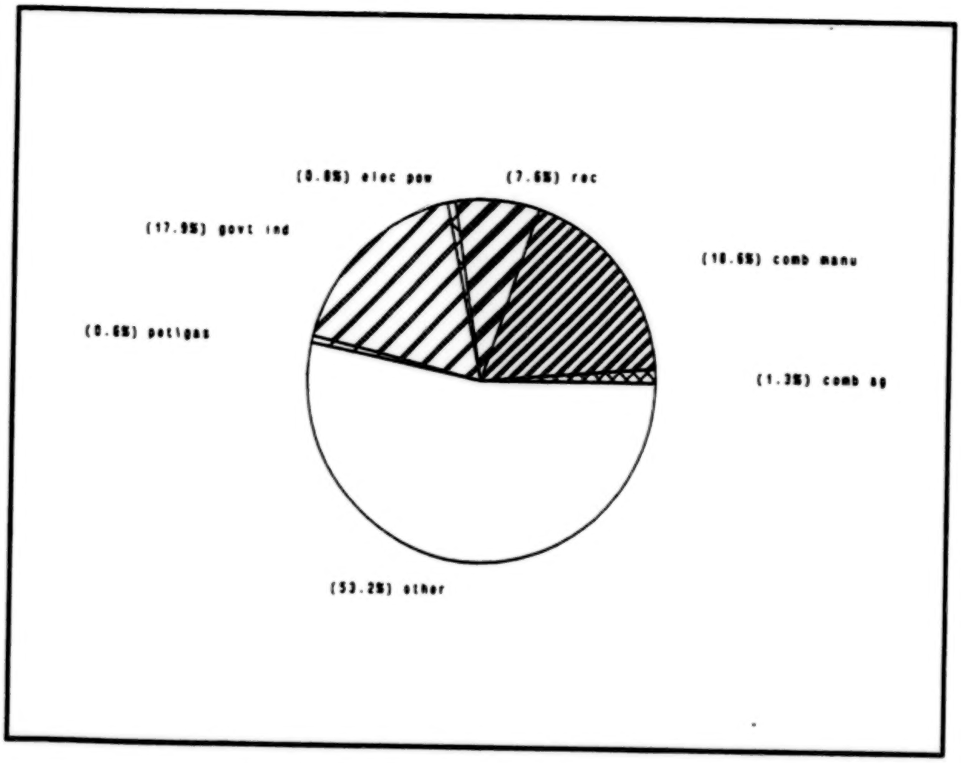

Figure II-3-CO-3. Earnings (1989) - Colorado

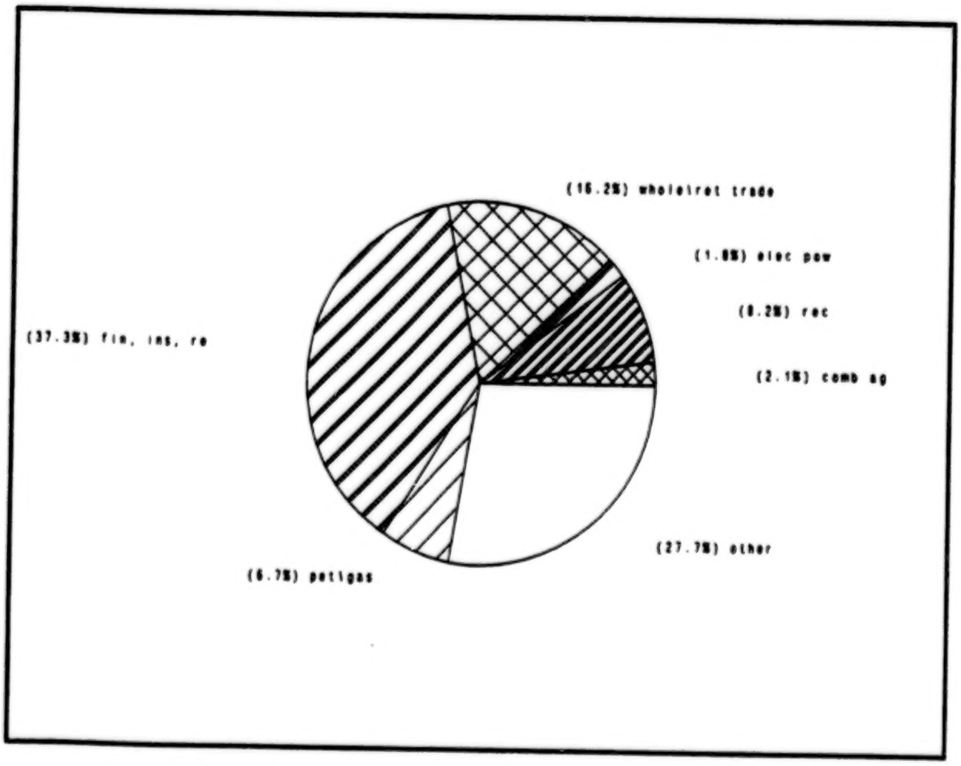

Figure II-3-CO-4. Indirect Business Taxes (1989) - Colorado

tax. The petroleum and gas production sector is 0.6 percent of personal income tax. (See Figure II-3-CO-5.)

2. Projections Over Time (1989 - 2020)

Overall, output is projected to be up 19 percent between 1989 and 2020. The total changes in employment are projected to be 25 percent. The total growth in earnings is predicted to be 23 percent. Indirect taxes will be up 21 percent. Personal income will grow 23 percent.

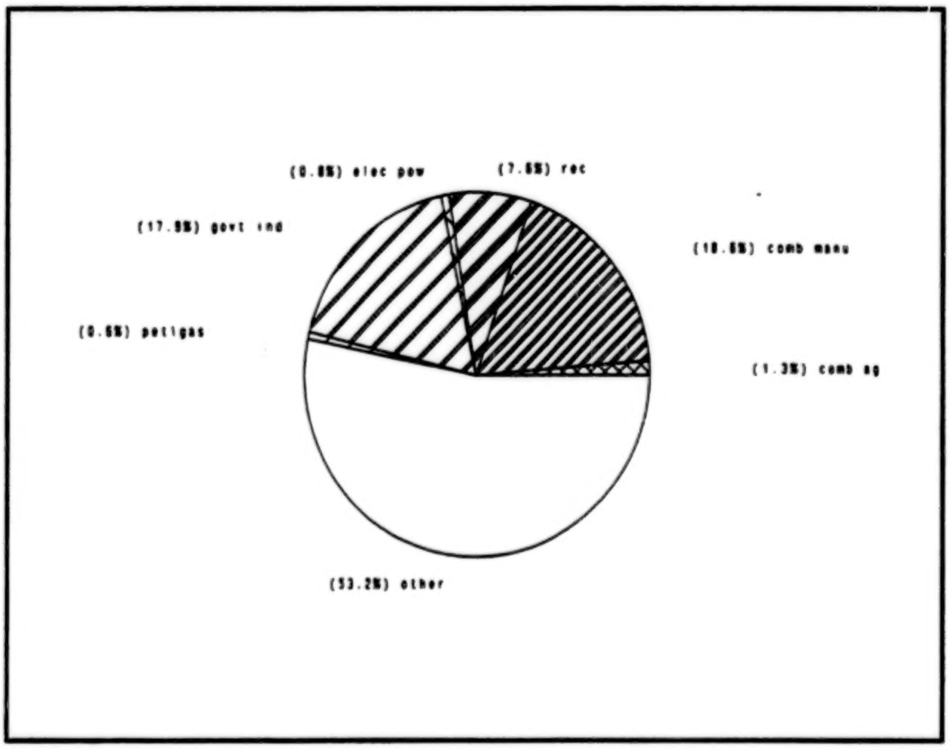

Figure II-3-CO-5. Personal Income Taxes (1989) - Colorado

B. State of New Mexico

1. Structure of Economic Activity

a. Output Levels

The output for the State of New Mexico is dominated by the petroleum and gas production sector with 20.1 percent of total output. The combined manufacturing sector is responsible for 8.9 percent of output. The recreation services sector is 5 percent of the total output. The electric power production sector is almost 4.1 percent of the total output. For the agricultural sectors, the livestock feed sector is almost 1 percent of output, and the other crops sector accounts for 0.68 percent of output. All agricultural sectors are responsible for 4.5 percent of the total output. (See Figure II-3-NM-1.)

b. Employment Levels

Employment is dominated by the government industry sector (22.3 percent), and the wholesale and retail trade sector (15.5 percent). The recreation services sector is also important part of total employment at 9.6 percent. The electric power production sector is 1.2 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.57 percent of employment, and the other crops sector is around 0.95 percent of employment. All agricultural sectors are responsible for approximately 4.1 percent of total employment. The petroleum and gas production sector accounts for about 1.7 percent of employment. (See Figure II-3-NM-2.)

c. Earnings

The government industry sector is responsible for 21.3 percent of total earnings. The recreation services sector is 5.9 percent of total earnings. The electric power production sector is 2.4 percent of the total earnings. For the agricultural sectors, the livestock feed sector is 0.14 percent of earnings, and the other crops sector is around 0.29 percent of earnings. All agricultural sectors are responsible for approximately 1.7 percent of total earnings. The petroleum and gas production sector delivers around 5.3 of total earnings. (See Figure II-3-NM-3.)

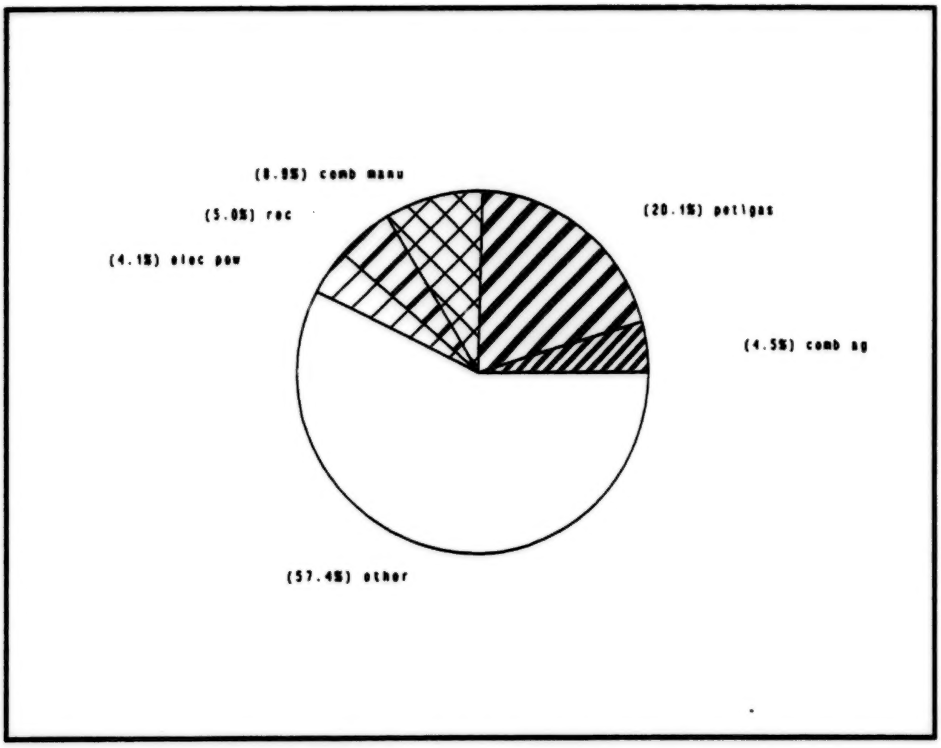

Figure II-3-NM-1. Output (1989) - New Mexico

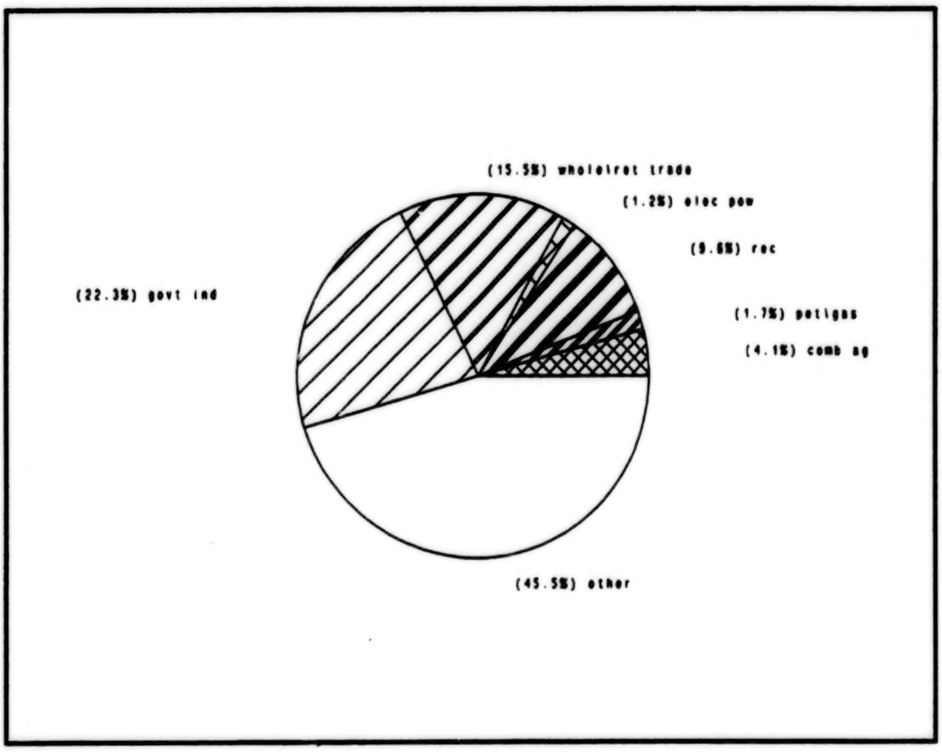

Figure II-3-NM-2. Employment (1989) - New Mexico

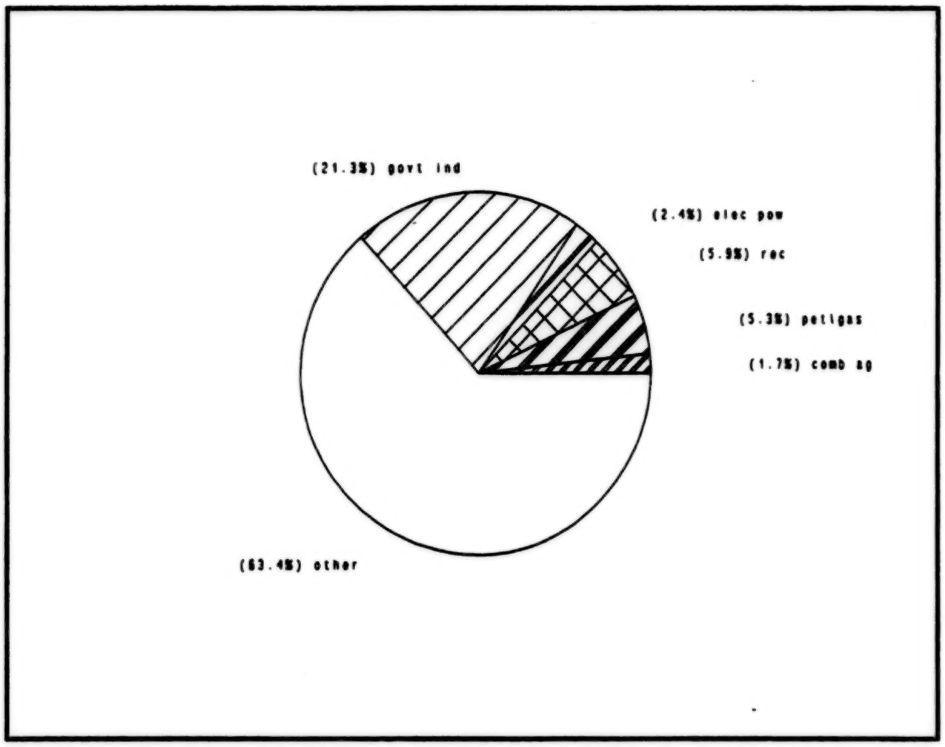

Figure II-3-NM-3. Earnings (1989) - New Mexico

d. Indirect Business Tax Levels

The petroleum and gas production sector is responsible for 41.4 percent of the indirect business taxes in New Mexico. The finance, insurance, and real estate sector is responsible for 16.4 percent of the indirect business tax. The recreation services sector pays 4.5 percent of the indirect business tax. The livestock feed sector is associated with almost 0.4 percent of the indirect business tax. The other crops sector is responsible for 0.16 percent of the indirect business tax. Total agricultural sectors are 2.0 percent of the indirect business tax. The electric power sector is responsible for 4.4 percent of the indirect business tax. (See Figure II-3-NM-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the government industry with 21.3 percent. Also the household and business services sector has an 11.4 percent share of the personal income taxes. The recreation services sector is about 5.9 percent of personal income tax. The livestock feed sector is associated with 0.13 percent of personal income tax. The other crops sector is responsible for approximately 0.3 percent of personal income tax. All agricultural sectors are associated with about 1.7 percent of all personal income tax. The electric power production is almost 2.4 percent of total personal income tax. The petroleum and gas production sector is 5.3 percent of personal income tax. (See Figure II-3-NM-5.)

2. Projections Over Time (1989 - 2020)

Overall, output is projected to be up 22 percent. The total changes in employment between 1989 and 2020 are projected to be 25 percent. The total growth in earnings are predicted to be a positive 22 percent. Total changes in indirect business taxes between 1989 and 2020 are a positive 28 percent. The total changes in personal income taxes between 1989 and 2020 are a positive 22 percent.

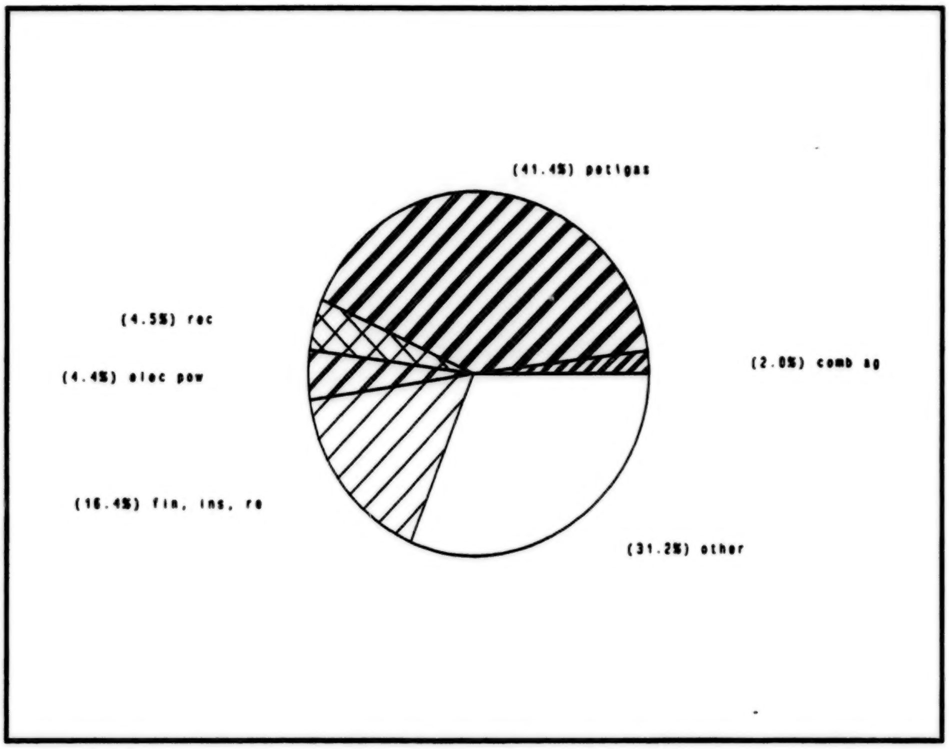

Figure II-3-NM-4. Indirect Business Taxes (1989) - New Mexico

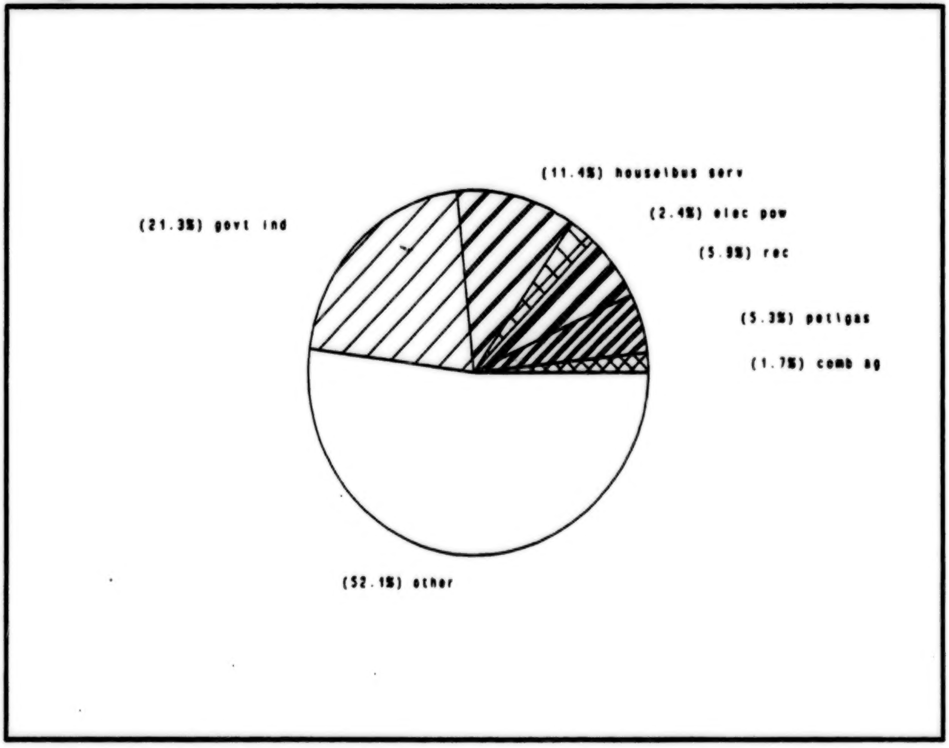

Figure II-3-NM-5. Personal Incomes Taxes (1989) - New Mexico

C. State of Utah

1. Structure of Economic Activity

a. Output Levels

The output for the State of Utah is dominated by the combined manufacturing sector (21.9 percent). The transportation, communication, and utilities sector also has a major share of output (10.5 percent). The recreation services sector is 4.6 percent of the total output. The electric power production sector is almost 1.9 percent of the total output. For the agricultural sectors, the livestock feed sector is 0.7 percent of output, and the other crops sector accounts for almost 0.2 percent of output. All agricultural sectors are responsible for 2.4 percent of the total output. The petroleum and gas production sector delivers about 3.2 percent of the total output. (See Figure II-3-UT-1.)

b. Employment Levels

Employment is dominated by the wholesale and retail trade sector (15.5 percent) and the government industry sector (17.9 percent). The recreation services sector is 8.4 percent of total employment. The electric power production sector is almost 0.5 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.39 percent of employment, and the other crops sector is around 0.32 percent of employment. All agricultural sectors are responsible for approximately 2.1 percent of total employment. The petroleum and gas production sector accounts for about 0.2 percent of employment. (See Figure II-3-UT-2.)

c. Earnings

The combined manufacturing sectors and the government industry sectors are responsible for 22.7 percent and 14.7 percent of total earnings. The recreation services sector is 5.1 percent of total earnings. The electric power production sector is 1 percent of the total earnings. For the agricultural sectors, the livestock feed sector is almost 0.1 percent of earnings, and the other crops sector is around 0.08 percent of earnings. All agricultural sectors are responsible for 0.8 percent of total earnings. The petroleum and gas production sector delivers about 0.7 percent of total earnings. (Figure II-3-UT-3.)

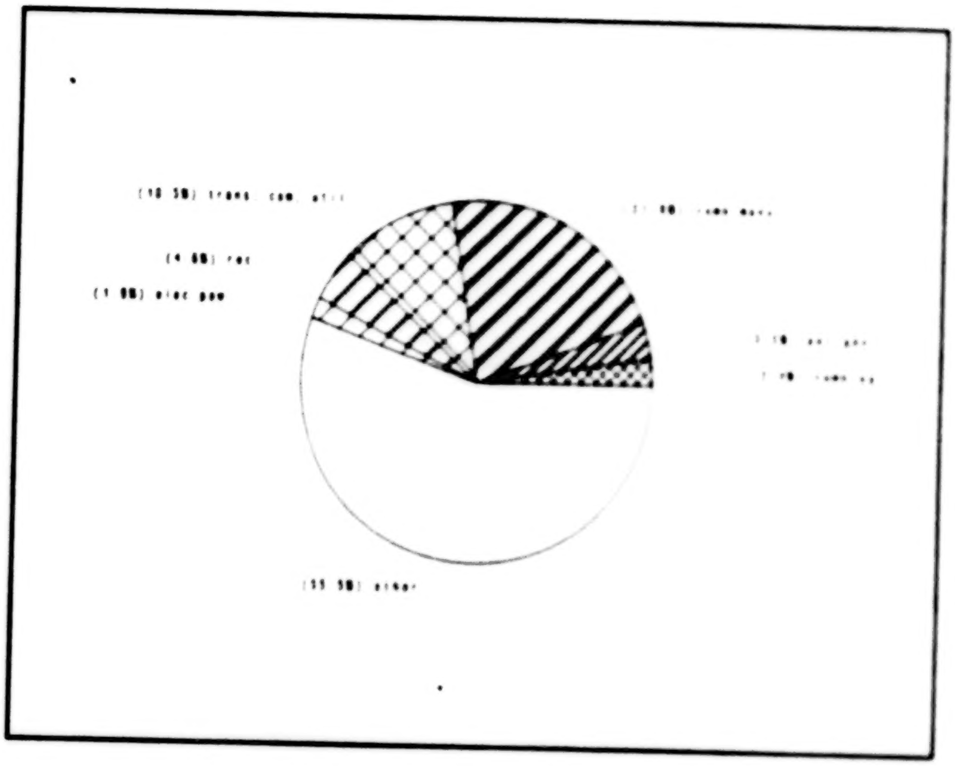

Figure II-3-UT-1. Output (1989) - Utah

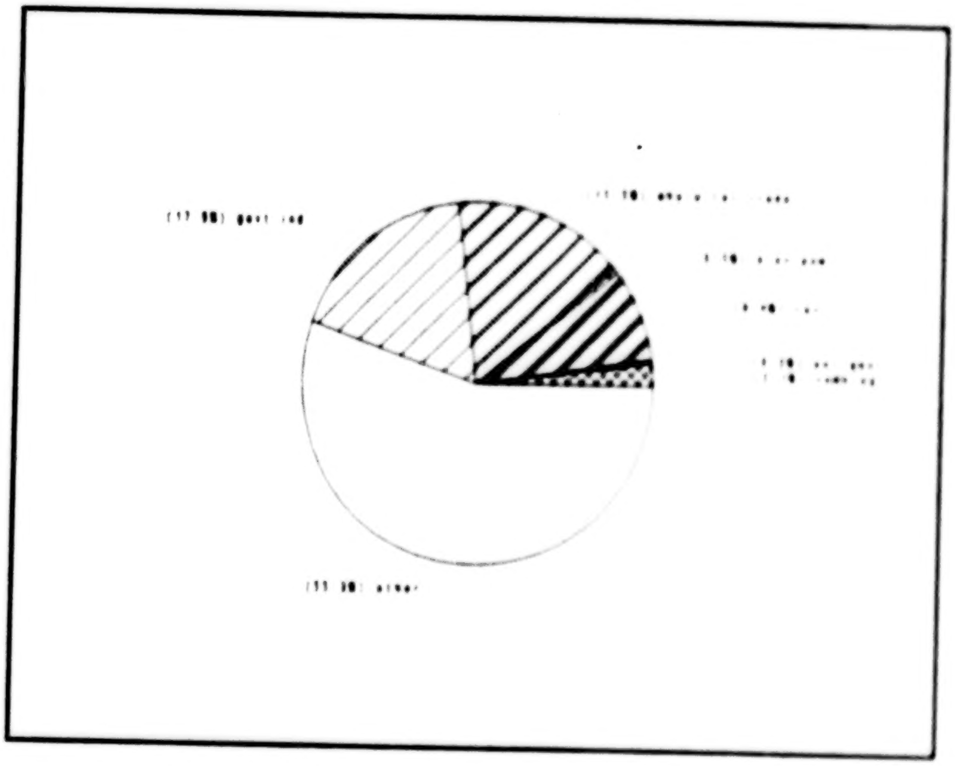

Figure II-3-UT-2. Employment (1989) - Utah

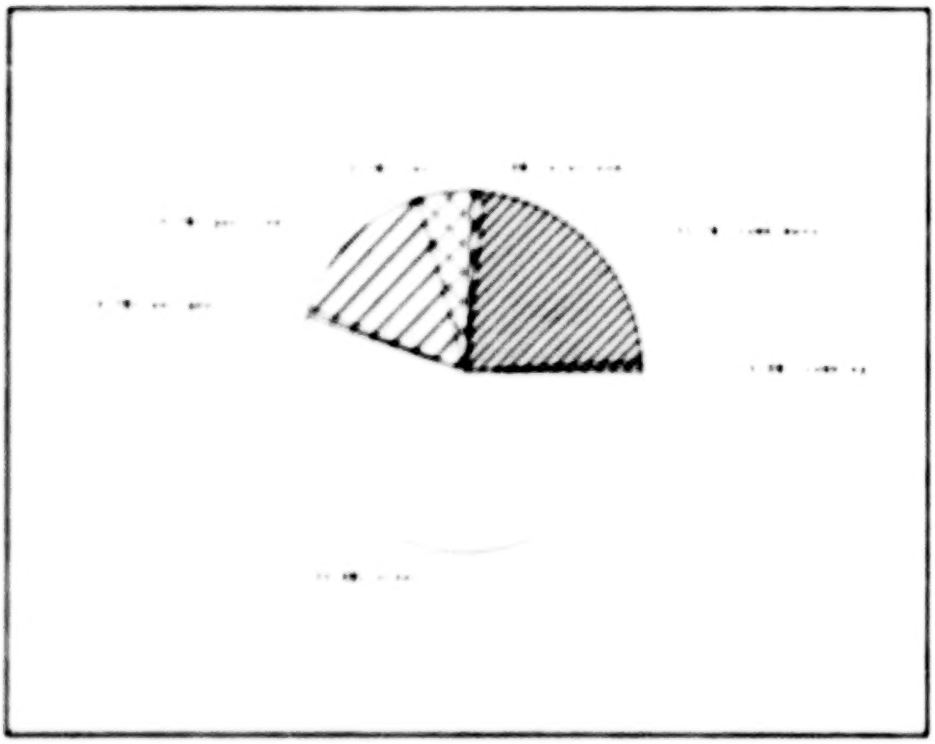

Figure II-3-UT-3. Earnings (1989) - Utah

d. Indirect Business Tax Levels

The finance, insurance, and real estate sector generates 30.4 percent of the indirect business tax for the State of Utah. The wholesale and retail trade sector is responsible for 16.8 percent of the indirect business tax. The recreation services sector pays 6.5 percent of the indirect business tax. Total agricultural sectors yield 1.4 percent of the indirect business tax (livestock feed sector, 0.43 percent, other crops, 0.09 percent). The petroleum and gas production sector is associated with 9 percent of indirect business tax, and the electric power sector generates 2.3 percent of the indirect business tax. (See Figure II-3-UT-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the combined manufacturing sector with 22.7 percent. Also the government industry sector has an 14.7 percent share of the personal income taxes. The recreation services sector is about 5.1 percent of personal income tax. The livestock feed sector is associated with 0.1 percent of personal income tax

The other crops sector is responsible for approximately 0.08 percent of personal income tax. All agricultural sectors are associated with about 0.8 percent of all personal income tax. The electric power production 1 percent of total personal income tax. The petroleum and gas production sector is 0.7 percent of personal income tax. (See Figure II-3-UT-5.)

2. Projections Over Time (1989 - 2020)

Overall, total output between 1989 and 2020 grows by 22 percent. Total employment grows by 17.6 percent. The total growth in earnings between 1989 and 2020 is 22 percent, and total indirect business taxes grows 28 percent.

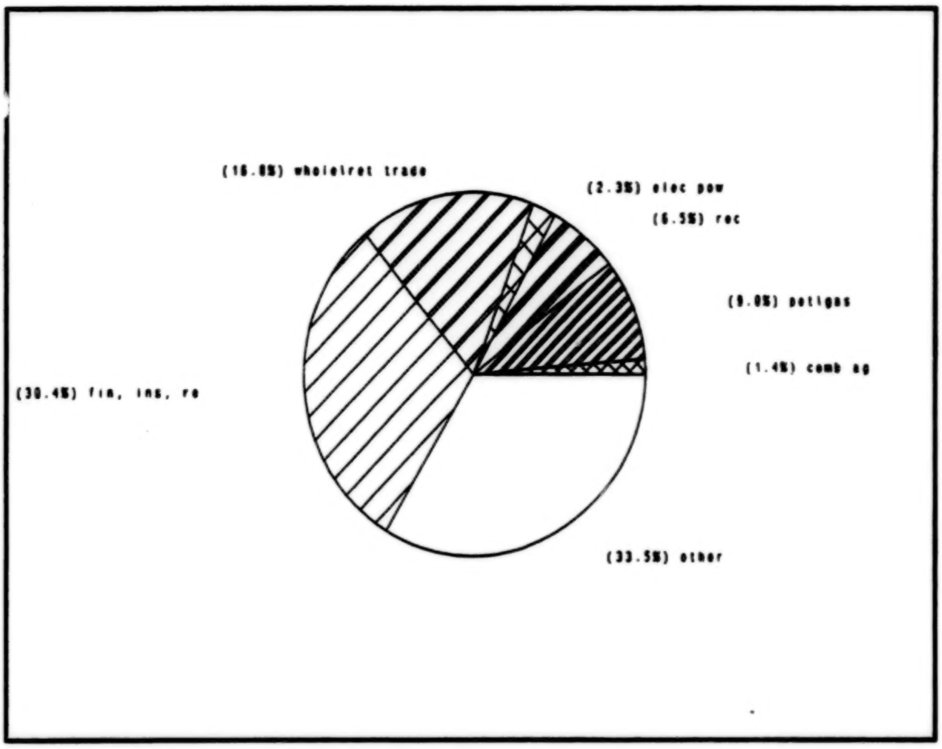

Figure II-3-UT-4. Indirect Business Taxes (1989) - Utah

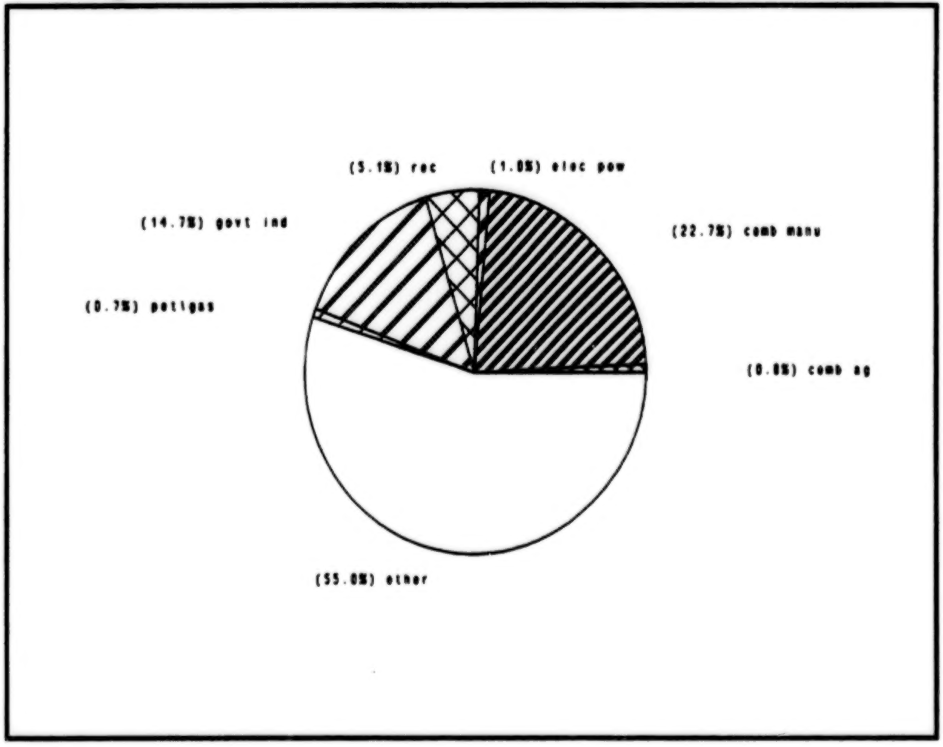

Figure II-3-UT-5. Personal Income Taxes (1989) - Utah

D. State of Wyoming

1. Structure of Economic Activity

a. Output Levels

The economy of the State of Wyoming is dominated by two sectors, as measured by output: the petroleum and gas production sector (17.3 percent) and the petroleum and coal products sector (15 percent). The transportation, communication, and utilities sector is responsible for 10.1 percent of the total output. The recreation services sector is 3.6 percent of the total output. The electric power production sector is about 8.4 percent of the total output. For the agricultural sectors, the livestock feed sector is slightly over 1 percent of output, and the other crops sector accounts for 0.29 percent of output. All agricultural sectors are responsible for 3.4 percent of the total output. (See Figure II-3-WY-1.)

b. Employment Levels

Employment is dominated by the government industries sector with 22 percent of the employment for the State of Wyoming. The recreation services sector is also an important part of total employment at 10 percent. The wholesale and retail trade sector is responsible for 9.2 percent of total employment. The electric power production sector is almost 3.7 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.89 percent of employment, and the other crops sector is around 0.67 percent of employment. All agricultural sectors are responsible for approximately 3.7 percent of total employment. The petroleum and gas production sector accounts for about 2.4 percent of employment. (See Figure II-3-WY-2.)

c. Earnings

The government industry and the non-petroleum mines sectors are responsible for 21.9 percent and 13.6 percent of total earnings. The recreation services sector is 4.9 percent of total earnings. The electric power production sector is about 5.2 percent of the total earnings. For the agricultural sectors, the livestock feed sector is 0.18 percent of earnings, and the other crops sector is around 0.12 percent of earnings. All agricultural

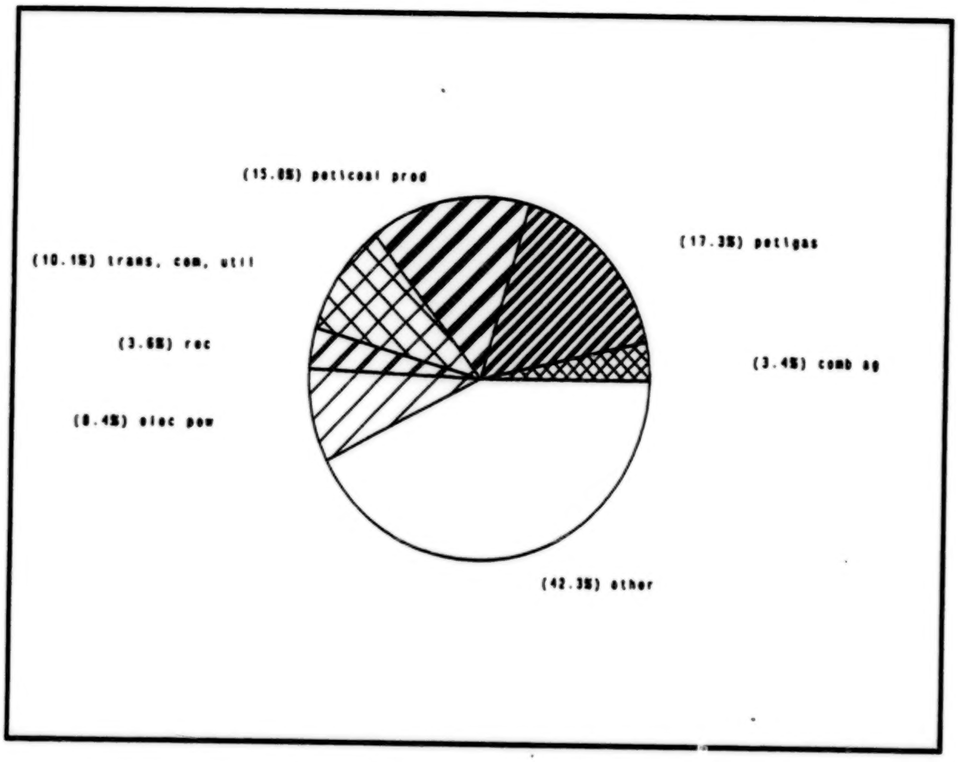

Figure II-3-WY-1. Output (1989) - Wyoming

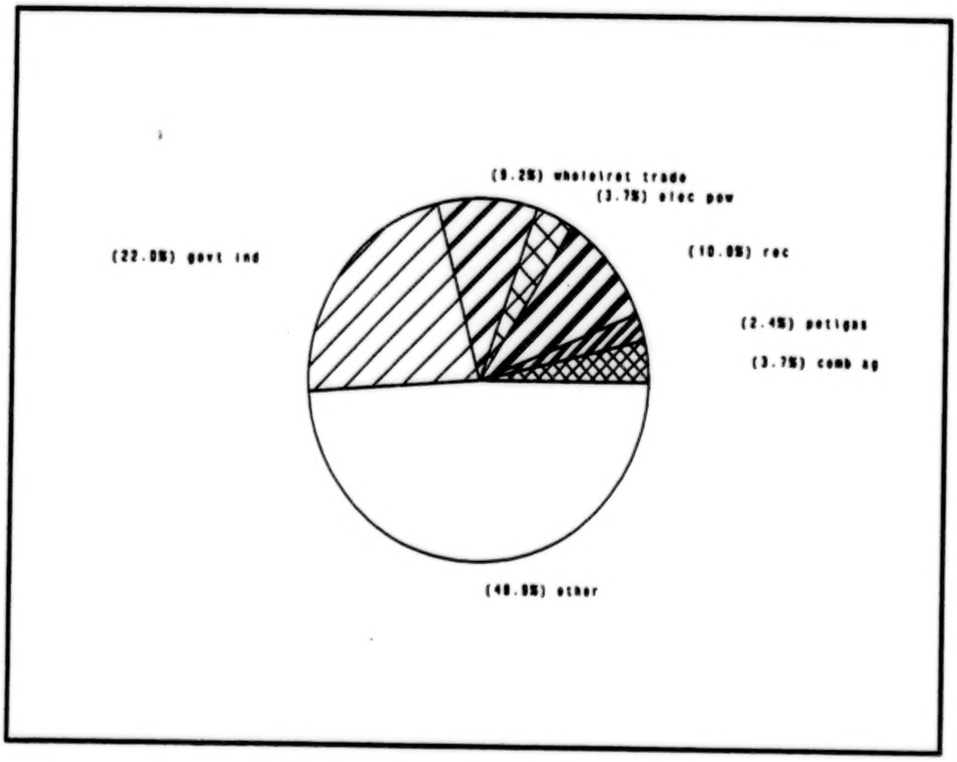

Figure II-3-WY-2. Employment (1989) - Wyoming

sectors are responsible for approximately 1.0 percent of total earnings. The petroleum and gas production sector delivers about 5.7 percent of total earnings. (See Figure II-3-WY-3.)

d. Indirect Business Tax Levels

The petroleum and gas production sector is responsible for 36.1 percent of the indirect business tax for the State of Wyoming. The petroleum and coal products sector is responsible for 13.7 percent of the indirect business tax. The recreation services sector pays 2.8 percent of the indirect business tax. The livestock feed sector is associated with approximately 0.42 percent of the indirect business tax. The other crops sector is responsible for 0.09 percent of the indirect business tax. Total agricultural sectors are 1.5 percent of the indirect business tax. The electric power sector is responsible for 9.8 percent of the indirect business tax. (See Figure II-3-WY-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the government industries sector with 21.9 percent. Also the non-petroleum mines sector has an 13.6 percent share of the personal income taxes. The recreation services sector is about 4.9 percent of personal income tax. The livestock feed sector is associated with 0.18 percent of personal income tax. The other crops sector is responsible for about 0.12 percent of personal income tax. All agricultural sectors are associated with about 1.0 percent of all personal income tax. The electric power production sector pays almost 5.2 percent of the total personal income tax. The petroleum and gas production sector comprises 5.7 percent of personal income tax. (See Figure II-3-WY-5.)

2. Projections Over Time (1989 - 2020)

Overall, output is up 22 percent between 1989 and 2020. The total changes in employment are projected to be 25 percent. The total growth in earnings is predicted to be 22 percent. Indirect business taxes will be up 28 percent. Personal income taxes will grow 22 percent.

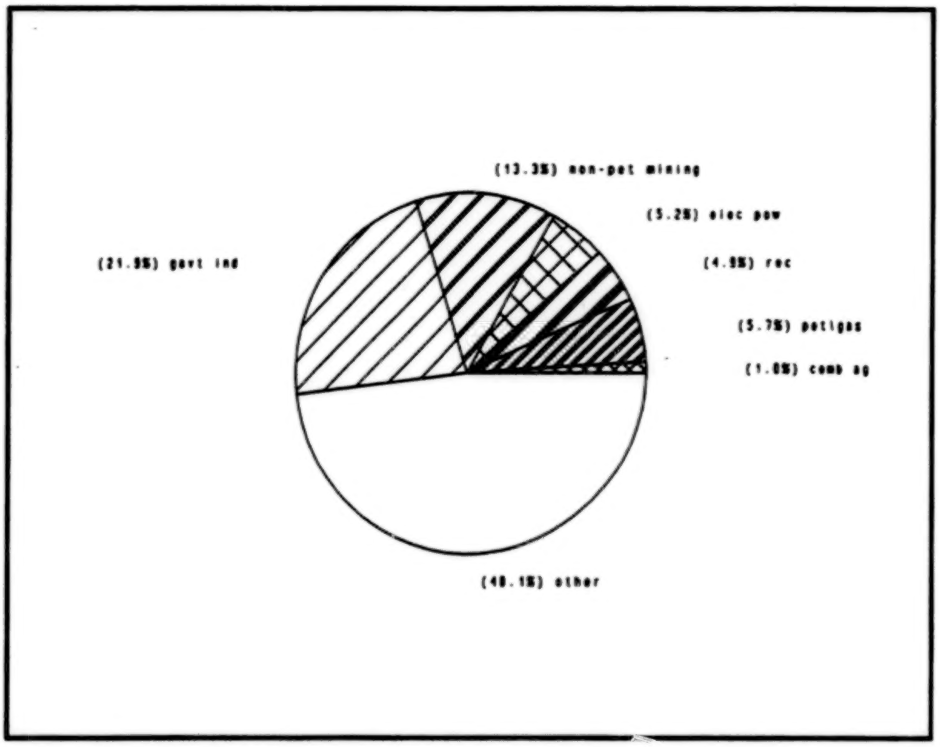

Figure II-3-WY-3. Earnings (1989) - Wyoming

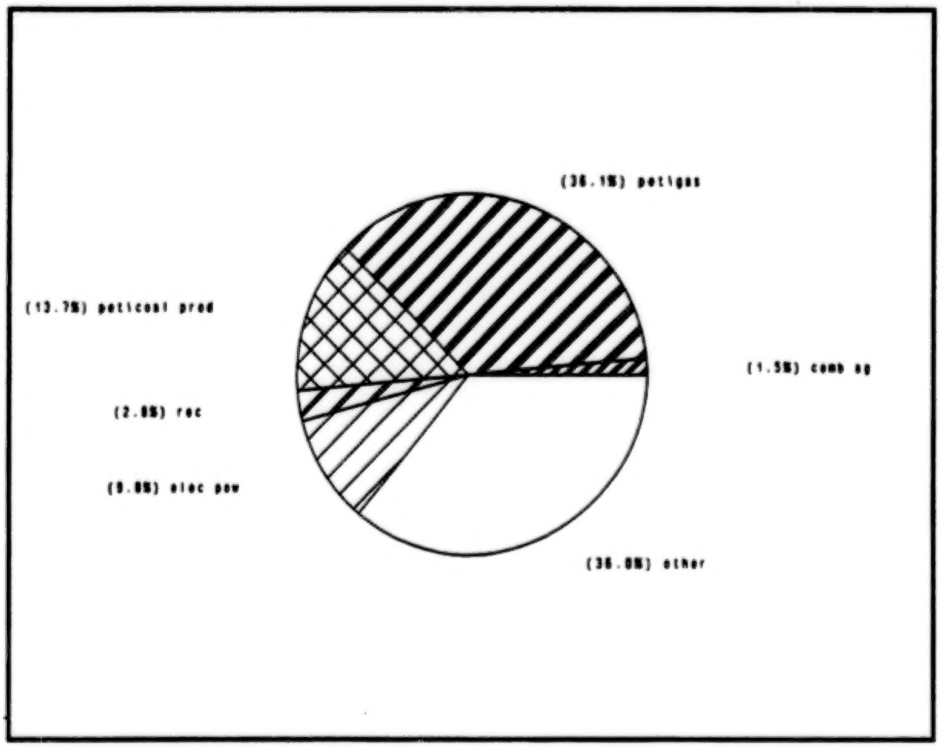

Figure II-3-WY-4. Indirect Business Taxes (1989) - Wyoming

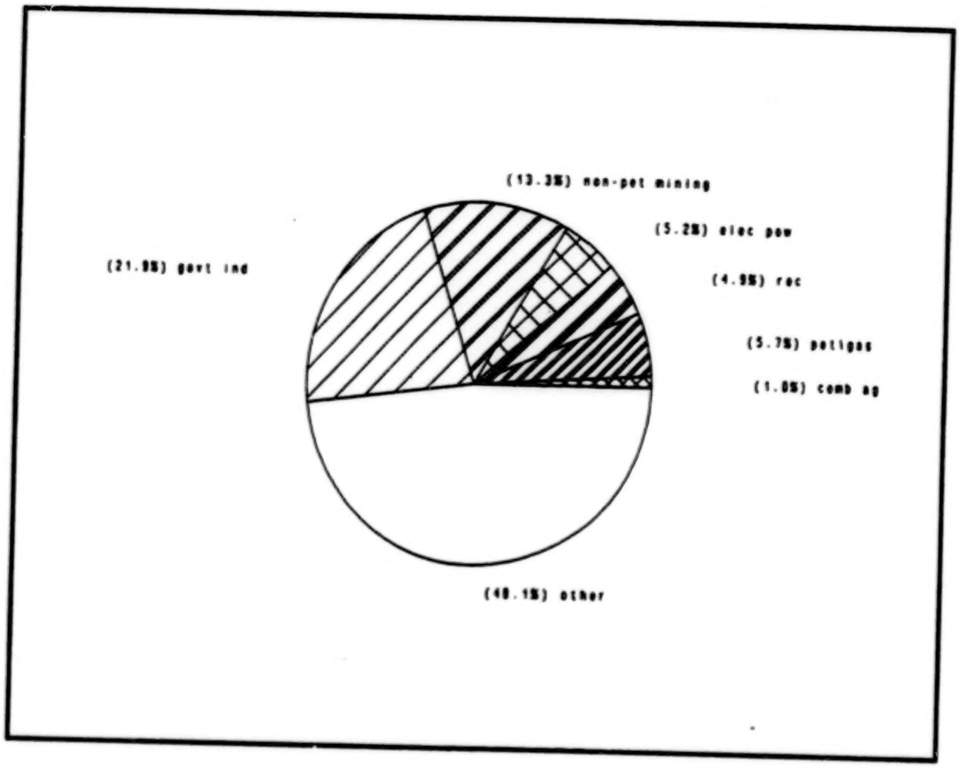

Figure II-3-WY-5. Personal Income Taxes (1989) - Wyoming

Volume II

Chapter 4: Lower Basin State Economies[4]

A. State of Arizona

1. Structure of Economic Activity

a. Output Levels

The economy of the State of Arizona is dominated by two sectors, as measured by output: the combined manufacturing sector (21.7 percent) and the finance, insurance, and real estate sector (15.1 percent). Other major sectors are the recreation services sector, with 8.1 percent of total State output; and the electric power production sector, with 4.1 percent of total State output. For the agricultural sectors, the livestock feed sector is 0.37 percent of output, and the other crops sector accounts for about 1.3 percent of output. All agricultural sectors are responsible for 3.2 percent of the total output. The petroleum and gas production sector contributes almost nothing to the percentage of total output. (See Figure II-4-AZ-1.)

b. Employment Levels

Several sectors dominate employment. The government industry sector accounts for 21.6 percent of total employment. Other major employers are the wholesale and retail trade sector (16.9 percent), the combined manufacturing sector (11.6 percent), and the recreation services sector (12.7 percent). The electric power production sector accounts for about 1.1 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.18 percent of employment, and the other crops sector is around 1.2 percent of employment. All agricultural sectors are responsible for approximately 3 percent of total employment. The petroleum and gas production sector does not account for percentage employment. (See Figure II-4-AZ-2.)

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[4] In the following sections, the activity for each of the Lower Basin States in the Colorado River Basin are presented for 1989. Projections through the year 2020 are presented in Chapter II-11 when the State-level impacts are discussed.

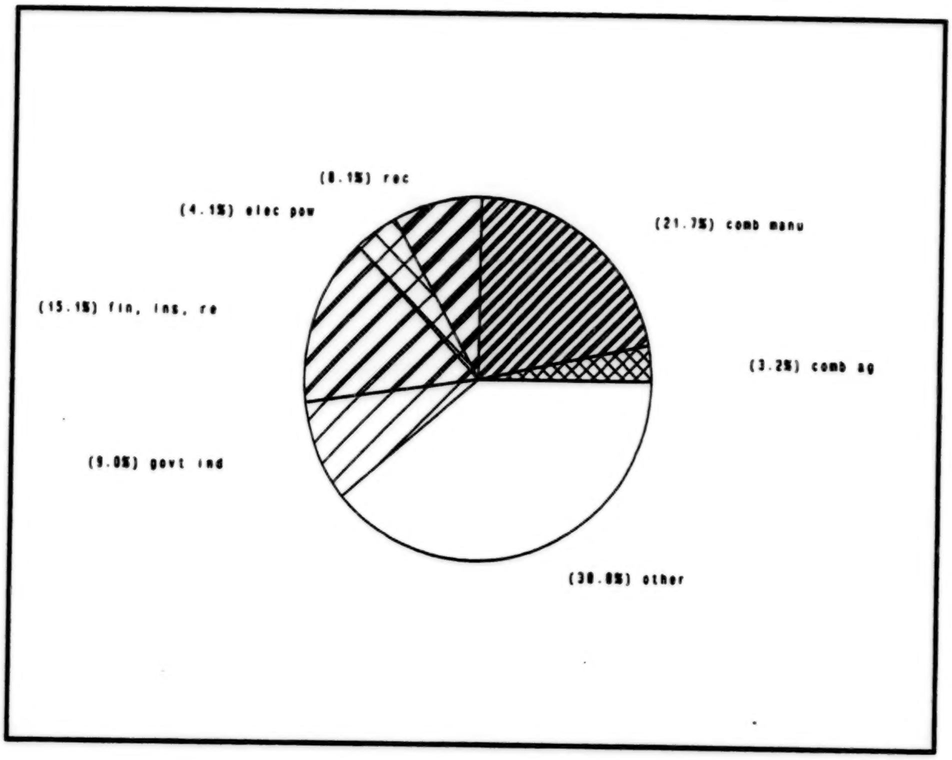

Figure II-4-AZ-1. Output (1989) - Arizona

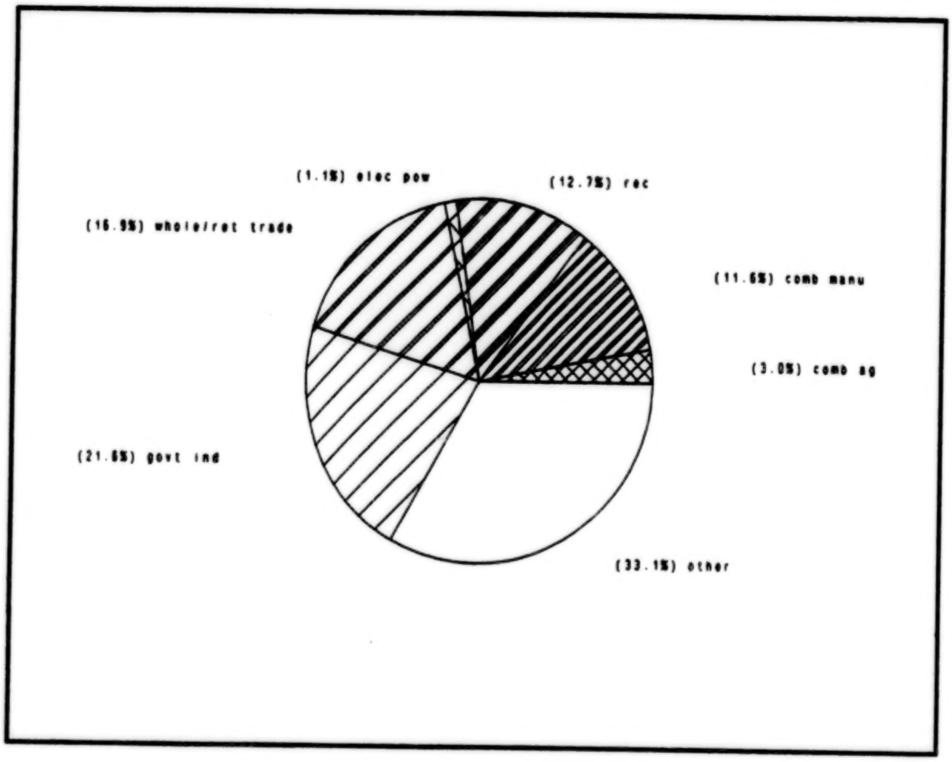

Figure II-4-AZ-2. Employment (1989) - Arizona

c. Earnings

The combined manufacturing sectors and the government industry sectors are responsible for 22.2 percent and 20.2 percent of total earnings. The recreation services sector is 7 percent of total earnings. The electric power production sector is almost 1.5 percent of the total earnings. Within the agricultural sectors, the livestock feed sector is 0.04 percent of earnings, and the other crops sector is around 0.6 percent of earnings. Taken as a whole, the agricultural sectors are responsible for approximately 1.3 percent of total earnings. (See Figure II-4-AZ-3.)

d. Indirect Business Tax Levels

The finance, insurance, and real estate sector is responsible for 44.9 percent of the indirect business tax generated in the State of Arizona. The electric power sector pays 3.1 percent of the indirect business tax. Total agricultural sectors generate 1.5 percent of the indirect business tax. Wholesale and retail trade is responsible for 21.7 percent of indirect business taxes for Arizona. (See Figure II-4-AZ-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the combined manufacturing and government industries sectors. The combined manufacturing sector is associated with 22.2 percent, while the government industries sector is associated with approximately 20.2 percent. The recreation services sector is about 7 percent of personal income tax. The livestock feed sector is associated with 0.04 percent of personal income tax. The other crops sector is responsible for approximately 0.59 percent of personal income tax. All agricultural sectors are associated with about 1.3 percent of all personal income tax. The electric power production yields 1.5 percent of total personal income tax. (See Figure II-4-AZ-5).

2. Projections Over Time (1989 - 2020)

Overall, output between 1989 and 2020 is projected to increase 22 percent. Employment is predicted to increase 25 percent. The total growth in earnings between 1989 and 2020 is predicted to be 22 percent. Total increases in indirect business taxes is predicted to be 28 percent. Personal income taxes is predicted to grow 22 percent.

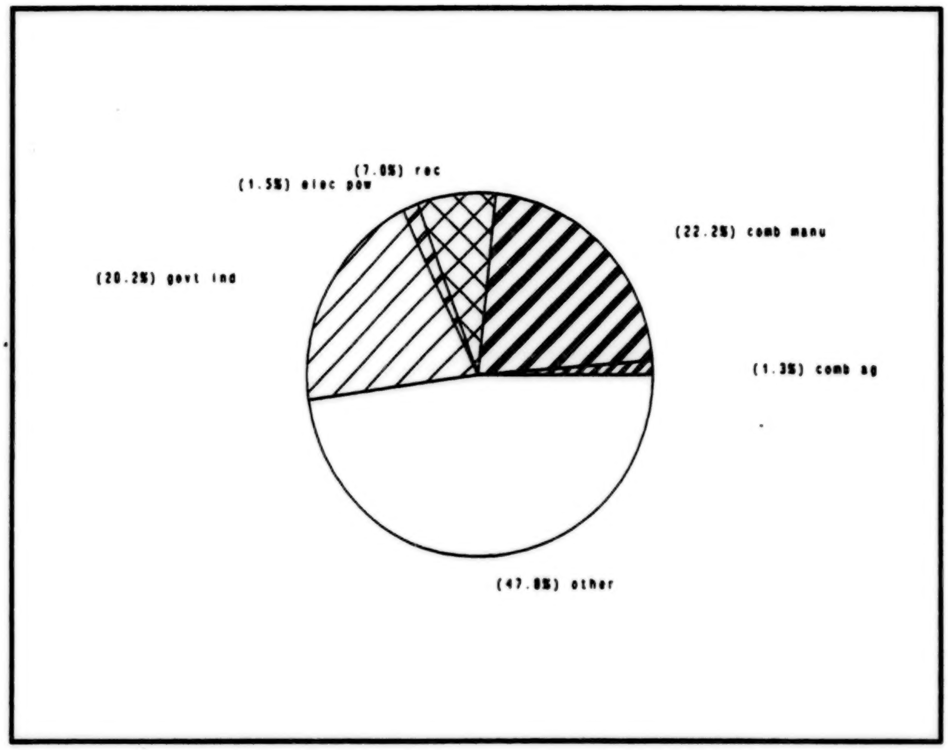

Figure II-4-AZ-3. Earnings (1989) - Arizona

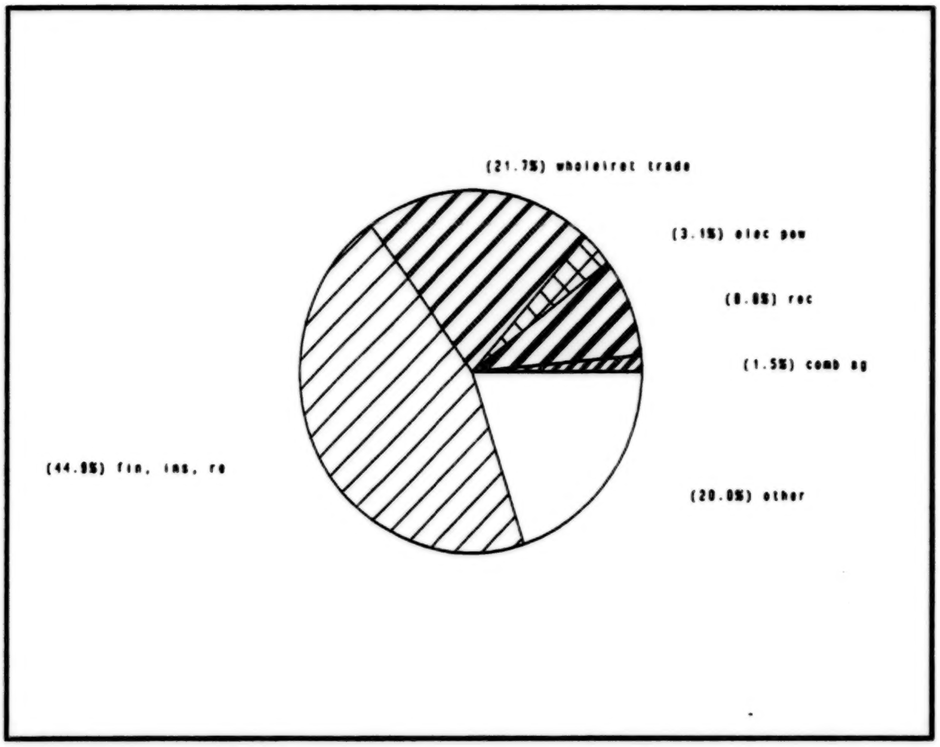

Figure II-4-AZ-4. Indirect Business Taxes (1989) - Arizona

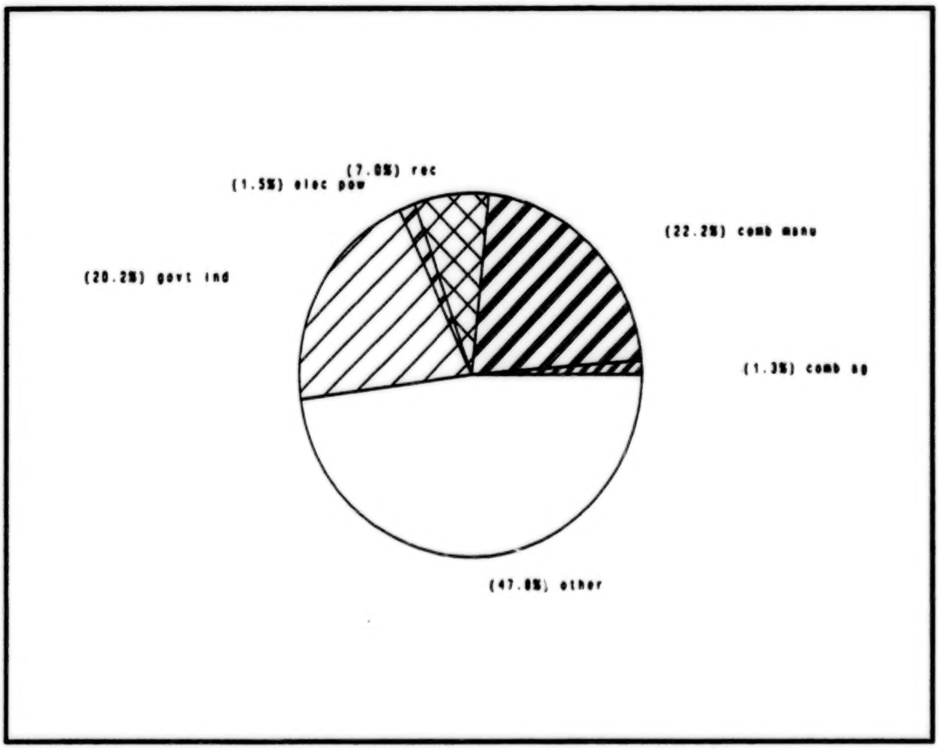

Figure II-4-AZ-5. Personal Income Taxes (1989) - Arizona

B. State of California

1. Structure of Economic Activity

a. Output Levels

The economy of the State of California is dominated by two sectors, as measured by output: the combined manufacturing sector (20.2 percent) and the finance, insurance, and real estate sector (15.5 percent). Other major sectors are the recreation services sector, at 7.4 percent of total output; and the electric power production sector, almost 1 percent of total output. For the agricultural sectors, the livestock feed sector is 0.25 percent of output, and the other crops sector accounts for slightly over 1 percent of output. All agricultural sectors are responsible for 2.8 percent of the total output. The petroleum and gas production sector delivers about 1.3 percent of total output. (See Figure II-4-CA-1.)

b. Employment Levels

There are several sectors that dominate employment. The government industry sector accounts for 16.7 percent of total employment. Other major employers are the combined manufacturing sector (13.9 percent), and the recreation services sector (9.7 percent). The electric power production sector is almost 0.3 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.1 percent of employment, and the other crops sector is around 2.2 percent of employment. All agricultural sectors are responsible for approximately 4.8 percent of total employment. The petroleum and gas production sector accounts for about 0.1 percent of employment. (See Figure II-4-CA-2.)

c. Earnings

The combined manufacturing sectors and the government industry sectors are responsible for 20.4 percent and 18.1 percent of total earnings. The recreation services sector is 6.5 percent of total earnings. The electric power production sector is almost 0.4 percent of the total earnings. Within the agricultural sectors, the livestock feed sector is 0.02 percent of earnings, and the other crops sector is around 0.5 percent of earnings. Taken as a whole, the agricultural sectors are responsible for approximately 1.5 percent of total earnings. The

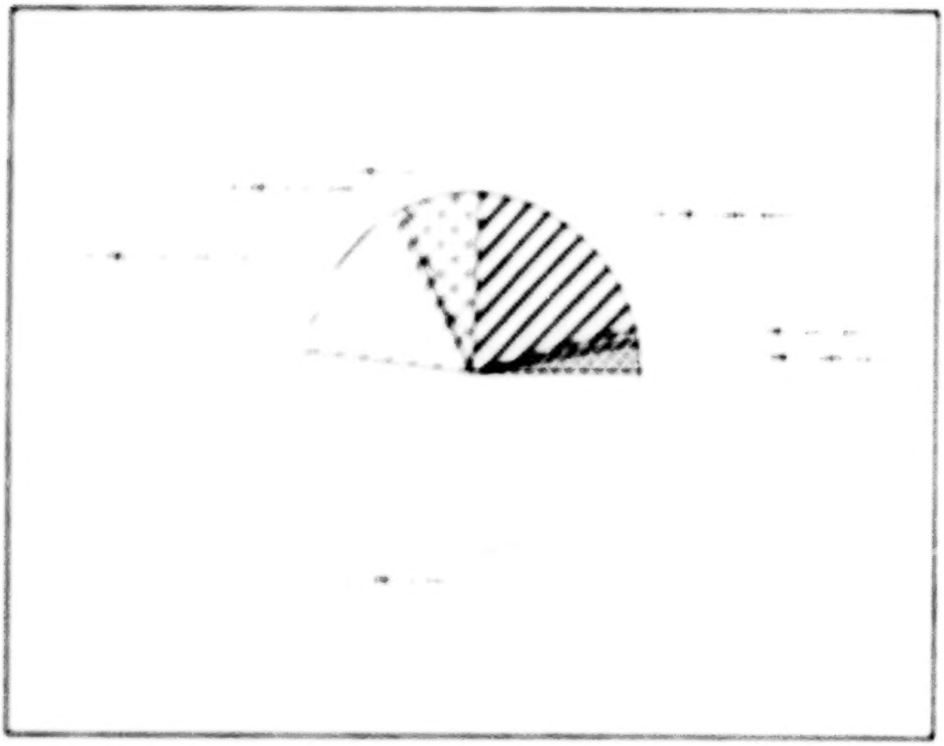

Figure II-4-CA-1. Output (1989) - California

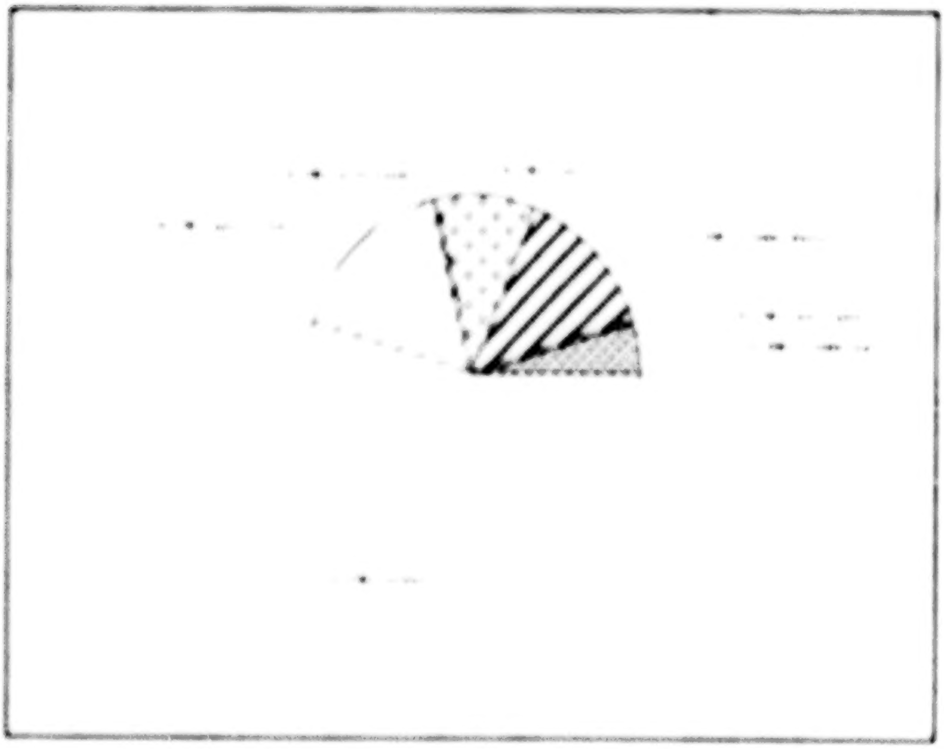

Figure II-4-CA-2. Employment (1989) - California

petroleum and gas production sectors delivers about 0.3 percent of total earnings. (See Figure II-4-CA-3.)

d. Indirect Business Tax Levels

The finance, insurance, and real estate sector is responsible for 46 percent of the indirect business tax generated in the State of California. The recreation services sector pays 8 percent of the indirect business tax. The livestock feed sector is associated with approximately 0.1 percent of the indirect business tax. The other crops sector is responsible for 0.4 percent of the indirect business tax. Total agricultural sectors generate slightly over 1 percent of the indirect business tax. The petroleum and gas production sector is associated with 3.6 percent of total indirect business tax. Electrical power is responsible for 0.9 percent of indirect business taxes for California. (See Figure II-4-CA-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the combined manufacturing and government industries sectors. The combined manufacturing sector is associated with 20.4 percent, while the government industries sector is associated with approximately 18 percent. The recreation services sector is about 6.5 percent of personal income tax. The livestock feed sector is associated with 0.02 percent of personal income tax. The other crops sector is responsible for approximately 0.5 percent of personal income tax. All agricultural sectors are associated with about 1.5 percent of all personal income tax. The electric power production yields 0.4 percent of total personal income tax. The petroleum and gas production sector contributes 0.3 percent of personal income tax. (See Figure II-4-CA-5.)

2. Projections Over Time (1989 - 2020)

Overall, output is projected to be up 20 percent between 1989 and 2020. The total changes in employment are projected to be 24 percent. The total growth in earnings is predicted to be 23 percent. Indirect taxes will be up 25 percent. Personal income will grow 23 percent.

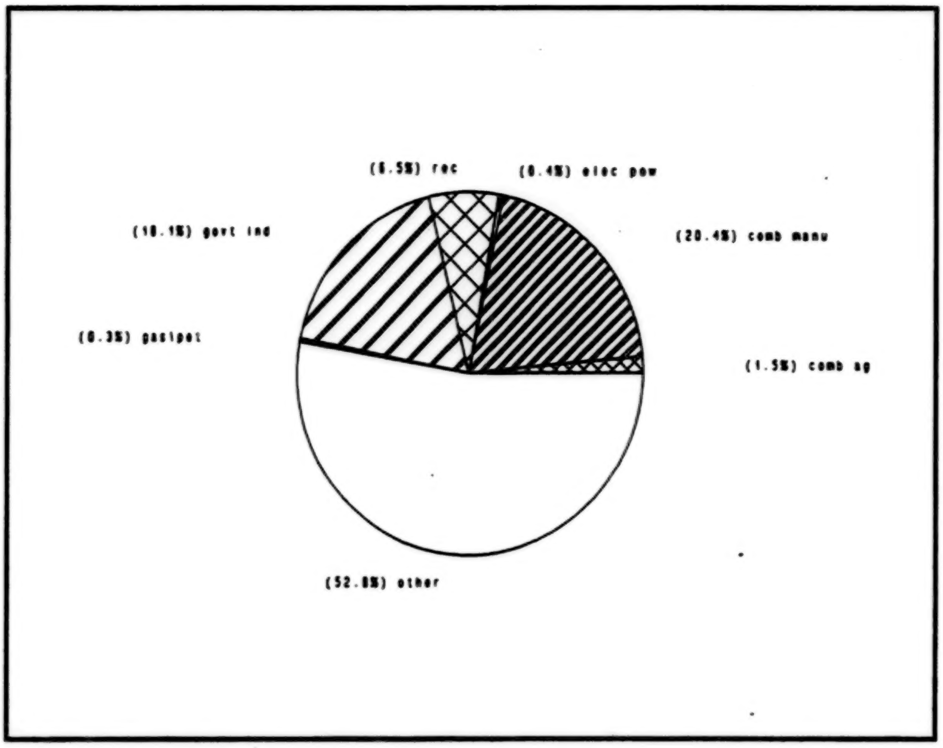

Figure II-4-CA-3. Earnings (1989) - California

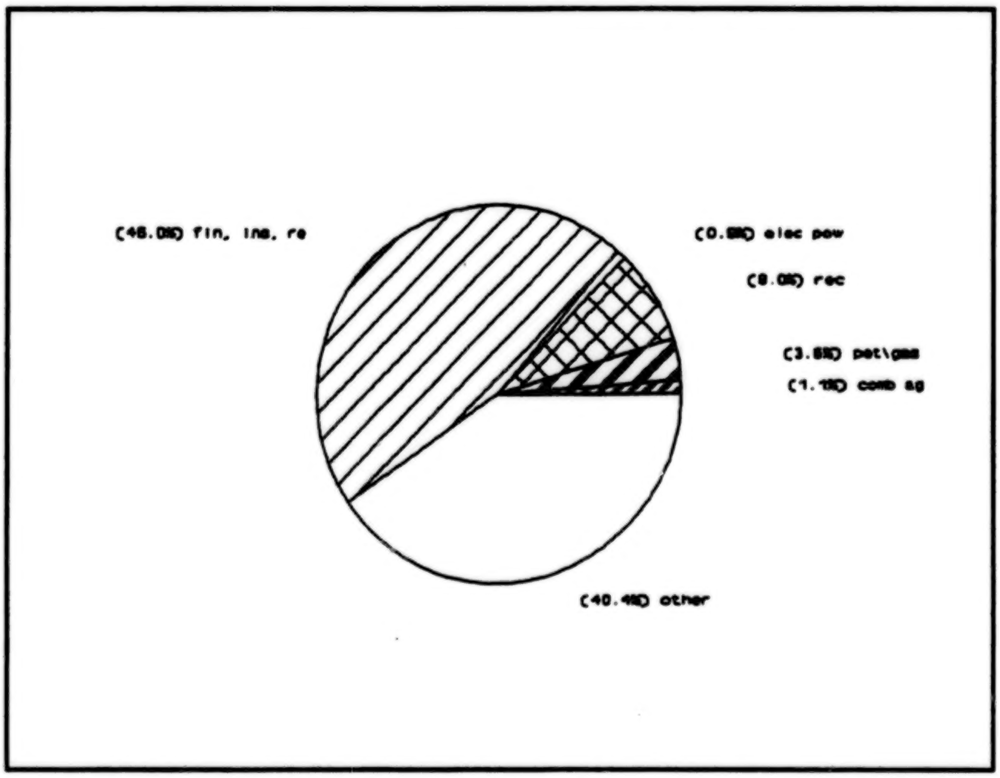

Figure II-4-CA-4. Indirect Business Taxes (1989) - California.

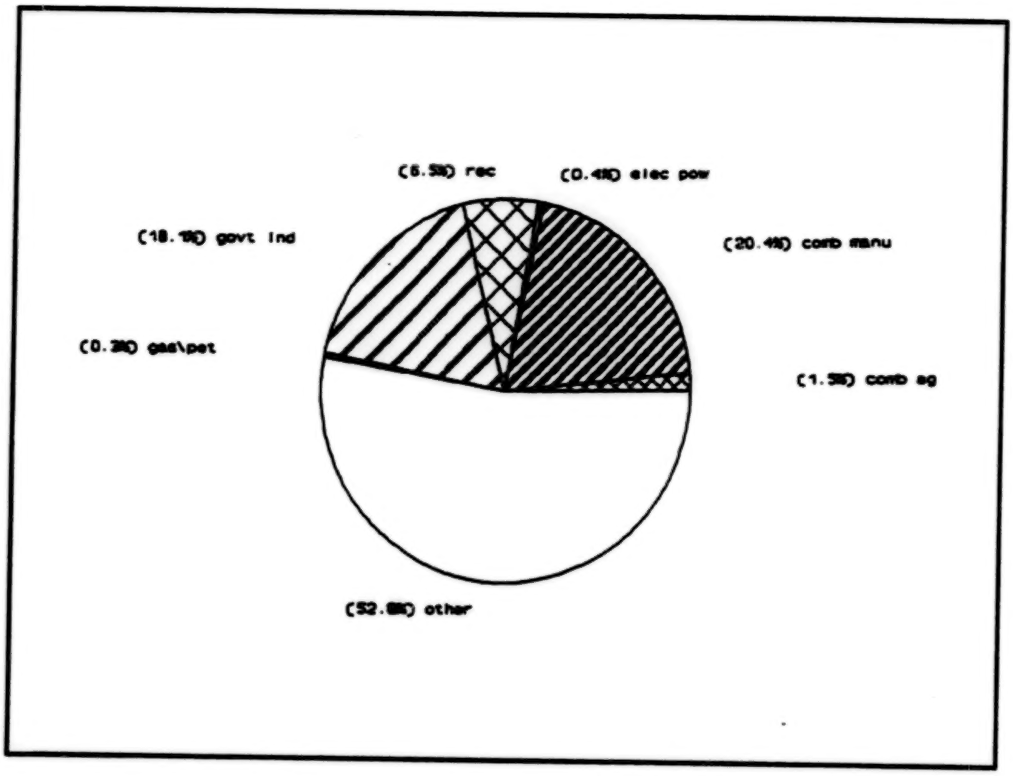

Figure II-4-CA-5. Personal Income Taxes (1989) - California.

C. State of Nevada

1. Structure of Economic Activity

a. Output Levels

The economy for the State of Nevada is dominated by the recreation sector, which contributes 30.2 percent of total output. The local amusement sector is responsible for around 9.7 percent of output. The new construction sector is associated with about 10.9 percent of output. The electric power production sector is almost 1.8 percent of total output. For the agricultural sectors, the livestock feed sector is 0.38 percent of output, and the other crops sector accounts for about 0.12 percent of output. All agricultural sectors are responsible for 1.2 percent of the total output. The petroleum and gas production sector delivers about 0.2 percent of the total output. (See Figure II-4-NV-1.)

b. Employment Levels

Employment is dominated by the recreation sector with 31.4 percent. The wholesale and retail trade sector is associated with 12.2 percent of employment. The government industry sector accounts for 10.9 percent of total employment. The electric power production sector accounts for about 0.9 percent of the total employment. For the agricultural sectors, the livestock feed sector is 0.24 percent of employment, and the other crops sector is around 0.15 percent of employment. All agricultural sectors are responsible for approximately 1.1 percent of total employment. The petroleum and gas production sector does not account for percentage employment. (See Figure II-4-NV-2.)

c. Earnings

The recreation services and the government industries sectors are responsible for 22.9 percent and 13.1 percent of total earnings. The construction sector accounts for 10.4 percent of total earnings. The electric power production sector is about 0.7 percent of the total earnings. Taken as a whole, the agricultural sectors are responsible for approximately 0.4 percent of total earnings. (See Figure II-4-NV-3.)

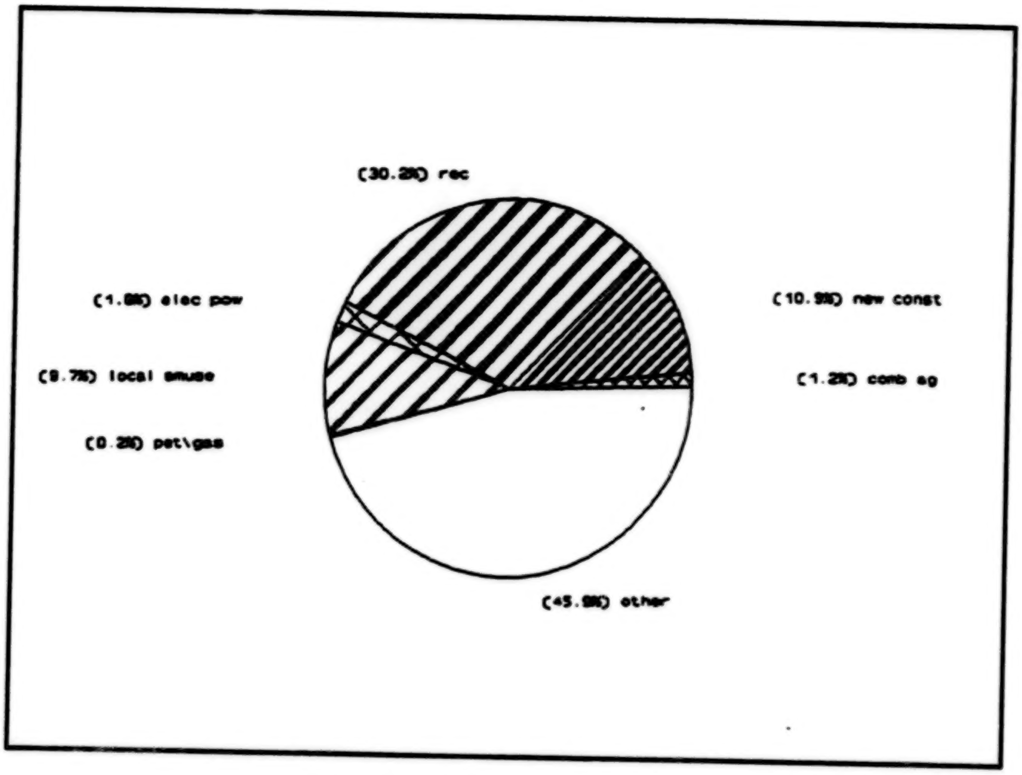

Figure II-4-NV-1. Output (1989) - Nevada.

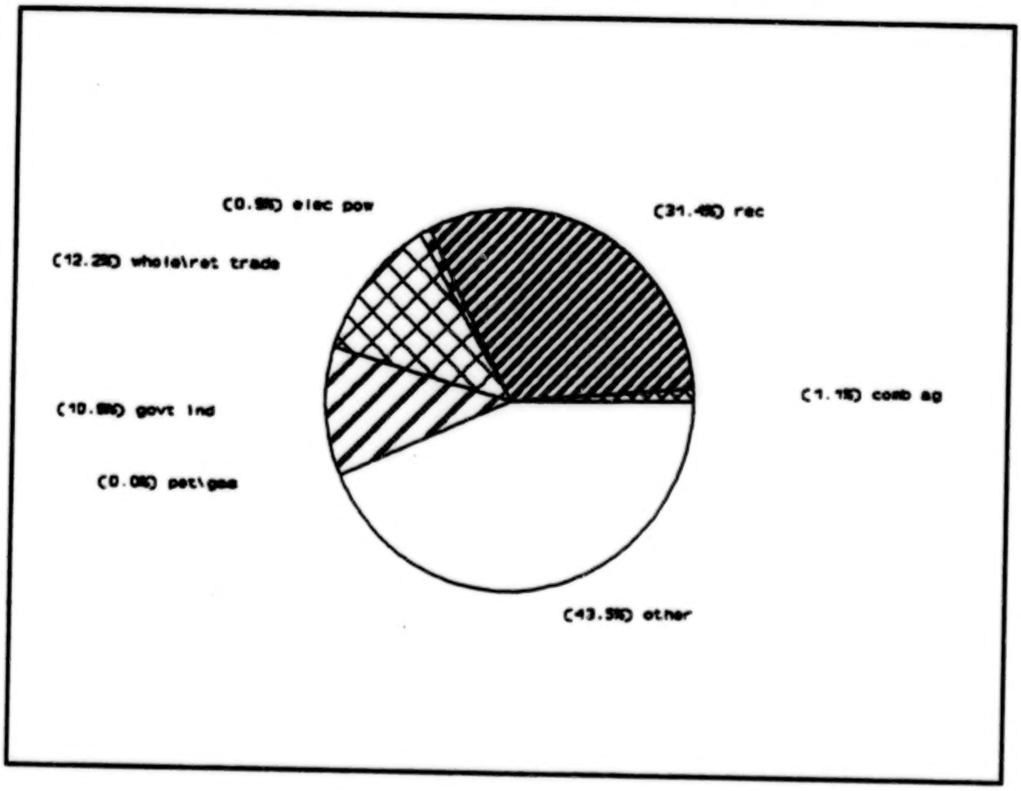

Figure II-4-NV-2. Employment (1989) - Nevada.

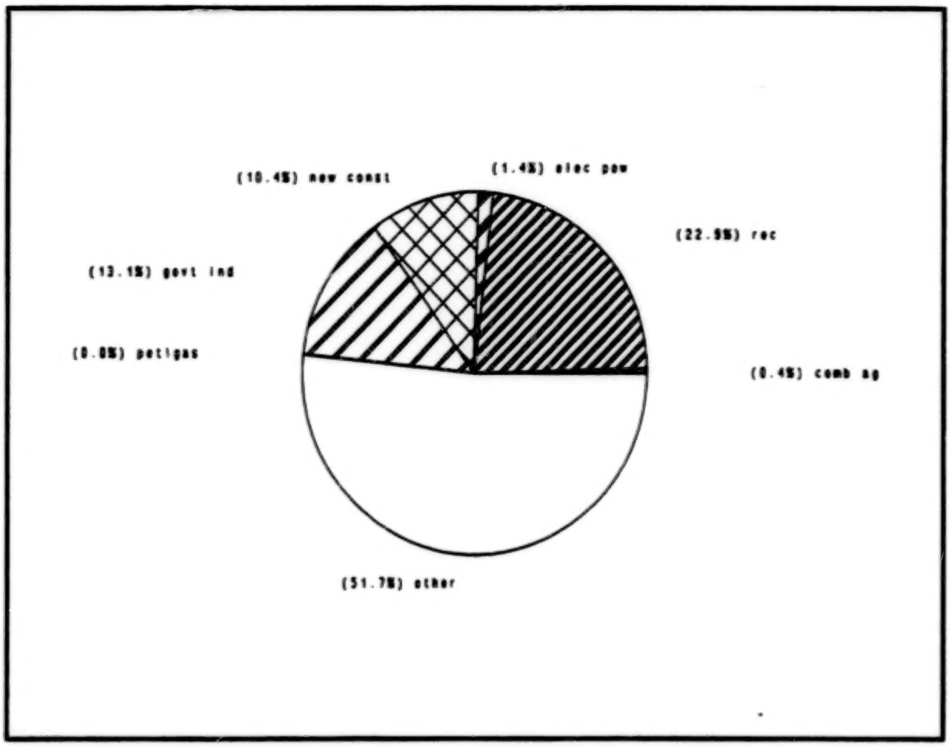

Figure II-4-NV-3. Earnings (1989) - Nevada

d. Indirect Business Tax Levels

The recreation services sector is responsible for 29 percent of the indirect business tax generated in the State of Nevada. The finance, insurance, and real estate services sector pays 23.9 percent of the indirect business tax. The wholesale and retail trade sector is responsible for 17.4 percent of the indirect business tax. The livestock feed sector contributes approximately 0.17 percent of the indirect business tax. The other crops sector is responsible for 0.03 percent of the indirect business tax. Total agricultural sectors generate 0.6 percent of the indirect business tax. The petroleum and gas production sector is associated with 0.4 percent of total indirect business tax. Electrical power is responsible for 1.6 percent of indirect business taxes for Nevada. (See Figure II-4-NV-4.)

e. Personal Income Tax Levels

The personal income tax is dominated by employees of the recreation services sector with 22.9 percent. The government industry sector has a 13.1 percent share of personal income taxes. The livestock feed sector is associated with 0.04 percent of personal income tax. The other crops sector is responsible for approximately 0.04 percent of personal income tax. All agricultural sectors are associated with about 0.4 percent of all personal income tax. The electric power production yields 1.4 percent of total personal income tax. The petroleum and gas production sector contributes zero percent of Nevada's total personal income tax. (See Figure II-4-NV-5.)

2. Projections Over Time (1989 - 2020)

Overall, output is projected to be up 29 percent between 1989 and 2020. The total changes in employment are projected to be 31 percent. The total growth in earnings is predicted to be 30 percent. Indirect taxes will be up 30 percent. Personal income will grow 30 percent.

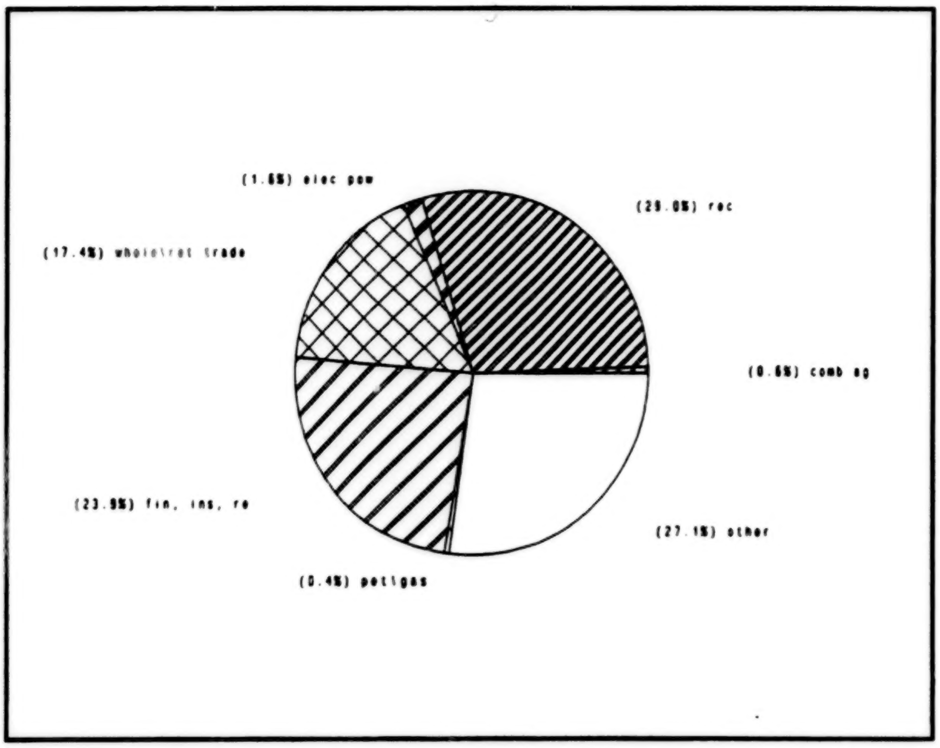

Figure II-4-NV-4. Indirect Business Taxes (1989) - Nevada

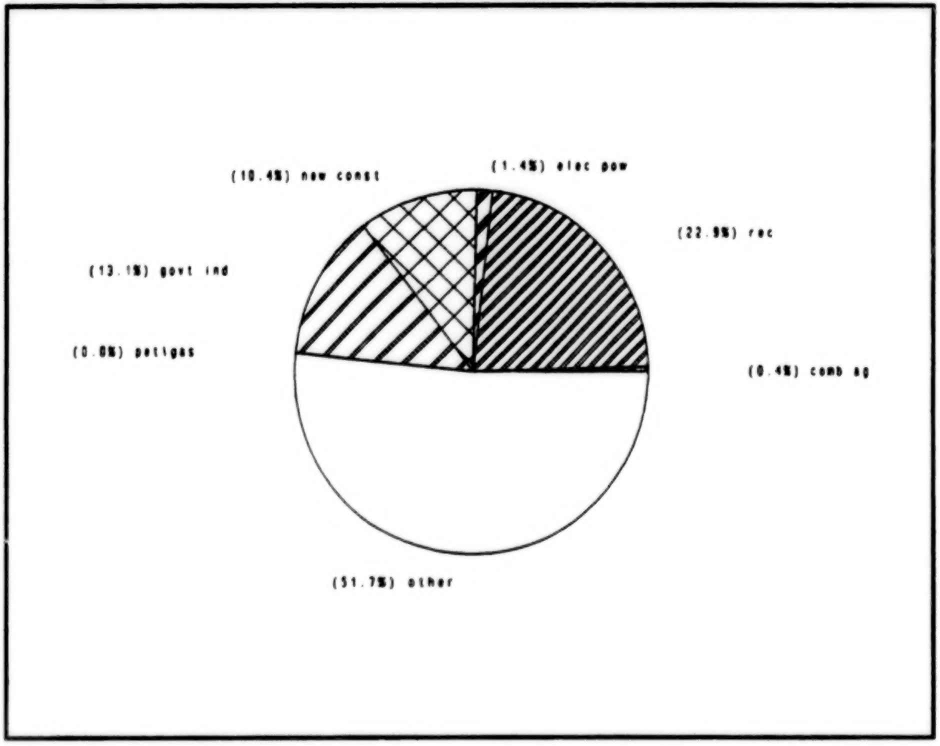

Figure II-4-NV-5. Personal Income Taxes (1989) - Nevada

Volume II

Chapter 5: Listing History and Proposed Critical Habitat Areas[5]

A. Overview

The listing history of the four endangered fishes and the proposed areas of critical habitat are discussed below. This discussion is an abbreviated version of what can be found in the biological support document.

B. Listing History of the Four Endangered Fishes

The Colorado squawfish and the humpback chub were listed as endangered species on March 11, 1967 (32 FR 4001). The bonytail was listed as endangered on April 23, 1980 (45 FR 27713). On May 16, 1975, USFWS published notice of its intent to determine the critical habitat for the Colorado squawfish, the humpback chub, and numerous other species (40 FR 21499). On September 14, 1978, USFWS proposed critical habitat for the Colorado squawfish (43 FR 41060). This proposal was later withdrawn (44 FR 12382; March 6, 1979) to comply with the 1978 amendments to the Act (16 U.S.C. 1531 et seq.), that required USFWS to include critical habitat in the listing of most species and to complete the listing process within 2 years from the date of the proposed rule or to withdraw the proposal from further consideration. USFWS did not complete the listing process within the 2-year deadline. The razorback sucker was proposed for listing as a threatened species on April 24, 1978 (43 FR 17375). The proposal was withdrawn on May 27, 1980 (45 FR 35410), in accordance with the 1978 amendments to the Act.

On March 15, 1989, USFWS received a petition dated March 14, 1989, from the Sierra Club, the National Audubon Society, the Wilderness Society, the Colorado Environmental Coalition, the Southern Utah Wilderness Alliance, and the Northwest Rivers Alliance to list the razorback sucker as an endangered species. USFWS made a positive finding in June

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[5] This chapter is edited from the material presented in the biological support document. References can be found in that document. This material is presented for continuity.

1989, and subsequently published a notice on August 15, 1989 (54 FR 33586). This notice also stated that USFWS was completing a status review and was requesting that additional information be provided by December 15, 1989. A proposed rule to list the razorback sucker as an endangered species was published on May 22, 1990 (55 FR 21154), and a final rule listing the fish without critical habitat was published on October 23, 1991 (56 FR 54957). In the final rule, USFWS concluded that critical habitat could not be determined at the time of listing, and questioned whether it was prudent to designate critical habitat for this fish. USFWS must determine critical habitat using the best scientific and commercial data available (50 CFR 424.12). Current knowledge of the life history needs of the razorback sucker was presented in USFWS's final rule (56 FR 54957). Bonytail, humpback chub, and Colorado squawfish life history needs were presented in the recovery plans for each of those species (USFWS 1990a; 1990b; 1991).

C. Historic Habitat and Proposed Critical Habitat

1. Historic Background

These endangered fishes evolved in the Colorado River system and were adapted to the natural environment that existed before large-scale water development began. Thus, they were adapted to a system of fluctuating seasonal and annual flows influenced by wet, average, and dry climatic periods. Recent population declines and disappearances of endemic fish species in much of their former range have been associated with relatively rapid and widespread anthropogenic changes. These changes have altered the physical and biological characteristics of many mainstream rivers in the Colorado River Basin and have occurred so rapidly that the fishes have not had time to adapt.

Dams and diversions have fragmented former fish habitats by restricting fish movement. As a result, genetic interchange (emigration and immigration of individuals) between some fish populations is nonexistent. Large floods, once normal in the Colorado River Basin, provided food and nutrient exchange between river channels and shallow-water floodplain habitats. These floods are now controlled by numerous dams. As a result of these dams, major changes also have occurred in water quality, quantity, temperature; sediment and nutrient transport; and other characteristics of the aquatic environment. The altered habitats that have resulted are now more suitable for introduced, nonnative fishes, some of which have flourished. These changes have greatly altered the river environment, and no unaltered habitat remains in the Colorado River Basin for the four endangered fish species.

2. Razorback Sucker

The razorback sucker is part of a unique fish fauna endemic to the Colorado River Basin. This species was once one of the most abundant and widely distributed of those found in the mainstream rivers of the Colorado River Basin. Historic riverine systems provided a wide variety of habitats for the razorback suckers, including backwaters, sloughs, and oxbow lakes. The razorback sucker was once abundant throughout the 3,500 miles of the Colorado River Basin (Figure II-5-1), and occurred primarily in the mainstem and major river tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and in the states of Baja California Norte and Sonora of Mexico.

These fishes were most abundant downstream of present-day Lake Mead, and very abundant around Yuma, Arizona. Few records show razorback suckers in Grand and Marble canyons. Archeological remains of razorback suckers were common in the Salton Sea area, but increasing salinity in this area made this habitat marginal for freshwater fishes after 1929. Razorback suckers historically occurred in most warmwater reaches of the Gila River drainage. Early reports suggest that this species was common in the Gila River nearly to the New Mexico border. Razorback suckers were abundant in the lower Salt River and in lower Tonto Creek, and this species occurred in the Verde River. Upstream distribution in the Salt River may have been limited by extensive canyon habitat.

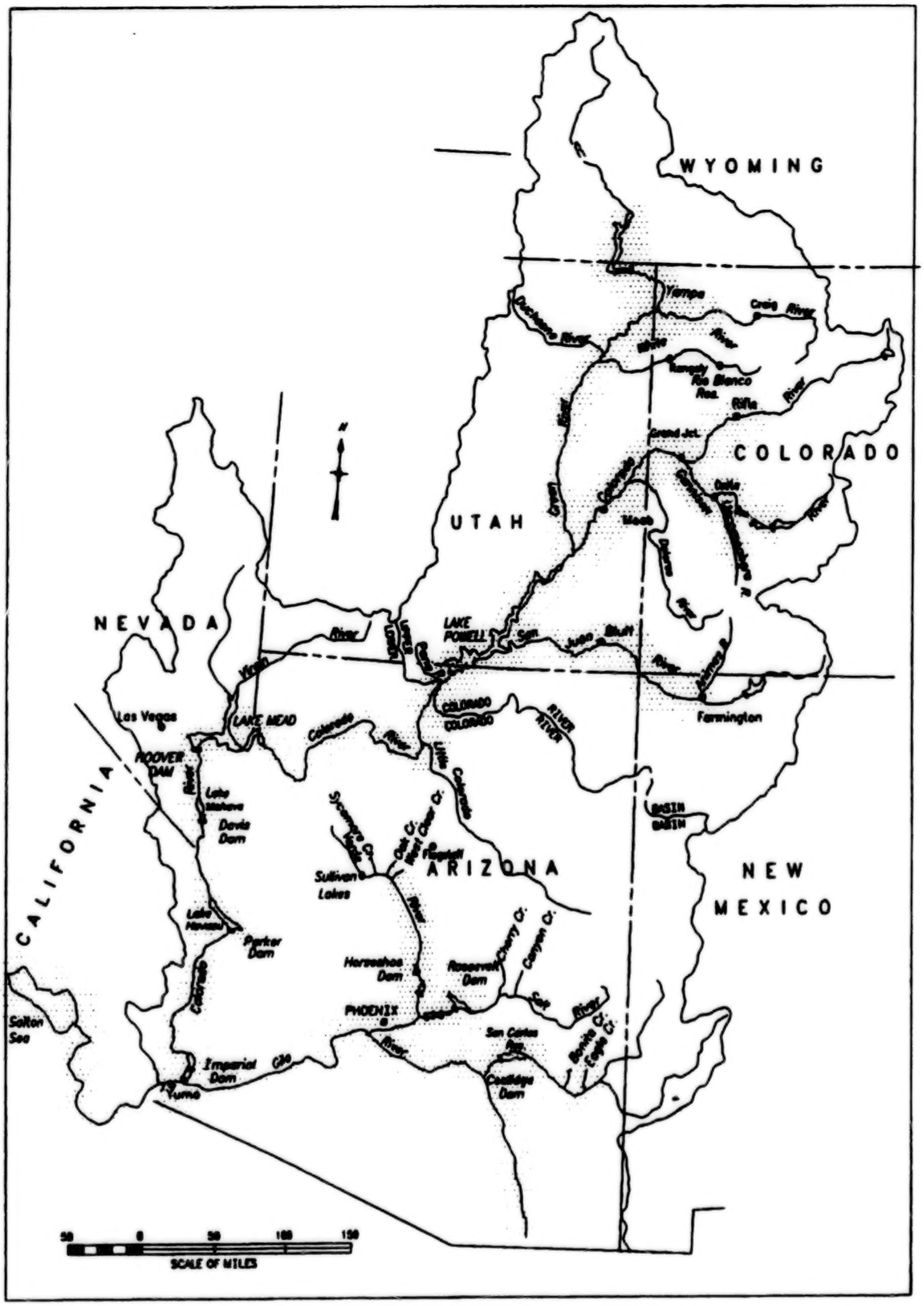

Figure II-5-1. Historical Distribution of the Razorback Sucker.

In the Upper Basin, razorback suckers historically occurred in the Colorado, Green, and San Juan River Basins. In the Colorado River, razorback suckers occurred from Lee's Ferry to Rifle, Colorado. They also were found in the Gunnison River upstream to Delta, Colorado. Razorback suckers were historically distributed in the Green River was from its confluence with the Colorado River upstream to Green River, Wyoming. Razorback suckers occur in the lower Yampa River and are rarely found upstream to the Little Snake River, Colorado. Historic status of the razorback sucker in the San Juan drainage is not well known. Some anecdotal evidence suggests that razorback suckers "ran" up the Animas River.

Upper Basin razorback sucker distribution has been reduced to about 750 miles. In the Upper Basin, the fish persists in the lower Yampa and Green Rivers, mainstream Colorado River, and lower San Juan River, but there is little recruitment in these remnant stocks. The largest extant riverine population occurs in the upper Green River Basin, but as of 1988, consisted of only about 1,000 fishes. In the absence of conservation efforts, it is presumed that wild populations will be lost as old fishes die and are not replaced. The largest concentration of razorback suckers in the Upper Basin occurs in the upper Green River from the mouth of the Duchesne River upstream to the Yampa River. It is estimated that 758 to 1,138 razorback suckers still inhabit the upper Green River. In the upper Colorado River subbasin, most razorback suckers occur in the Grand Valley area where the number of adult captures has declined appreciably since 1974. Recent studies on the San Juan River found razorback suckers in the San Juan arm of Lake Powell near Piute Farms, and one adult male near Bluff, Utah.

In the Lower Basin, the decline of razorback suckers was noted shortly after impoundment of Lake Mead in 1935. Now, the only substantial population, estimated at approximately 60,000 adult razorback suckers, exists in Lake Mohave.

Small numbers of razorback suckers sporadically occur in Lake Mead and the Grand Canyon and below Lake Mohave in the mainstem and associated impoundments and canals. Successful spawning has been documented in Lake Mohave, and numerous larvae have been collected. However, juveniles have rarely been found in samples collected since the early 1950s.

USFWS is proposing 15 reaches of the Colorado River system (Figure II.5-2) for designation as critical habitat for the razorback sucker. In the Upper Basin, critical habitat is being proposed in the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan rivers. Portions of the Colorado, Gila, Salt, and Verde rivers are being proposed in the Lower Basin. Of the historical range of razorback sucker, 52 percent is proposed for designation as critical habitat. This area comprises reaches in each of the major basins of the historic range. Other areas that are not proposed also may be important and may contribute to the eventual recovery of razorback sucker. Although razorback suckers were once more common and occupied more area in the Lower Basin, their habitat in the Upper Basin has been less altered. However, this phenomenon does not necessarily imply that razorback suckers are more recoverable in the Upper Basin, but suggests that current habitat conditions warrant proposing a larger percentage of the Upper Basin.

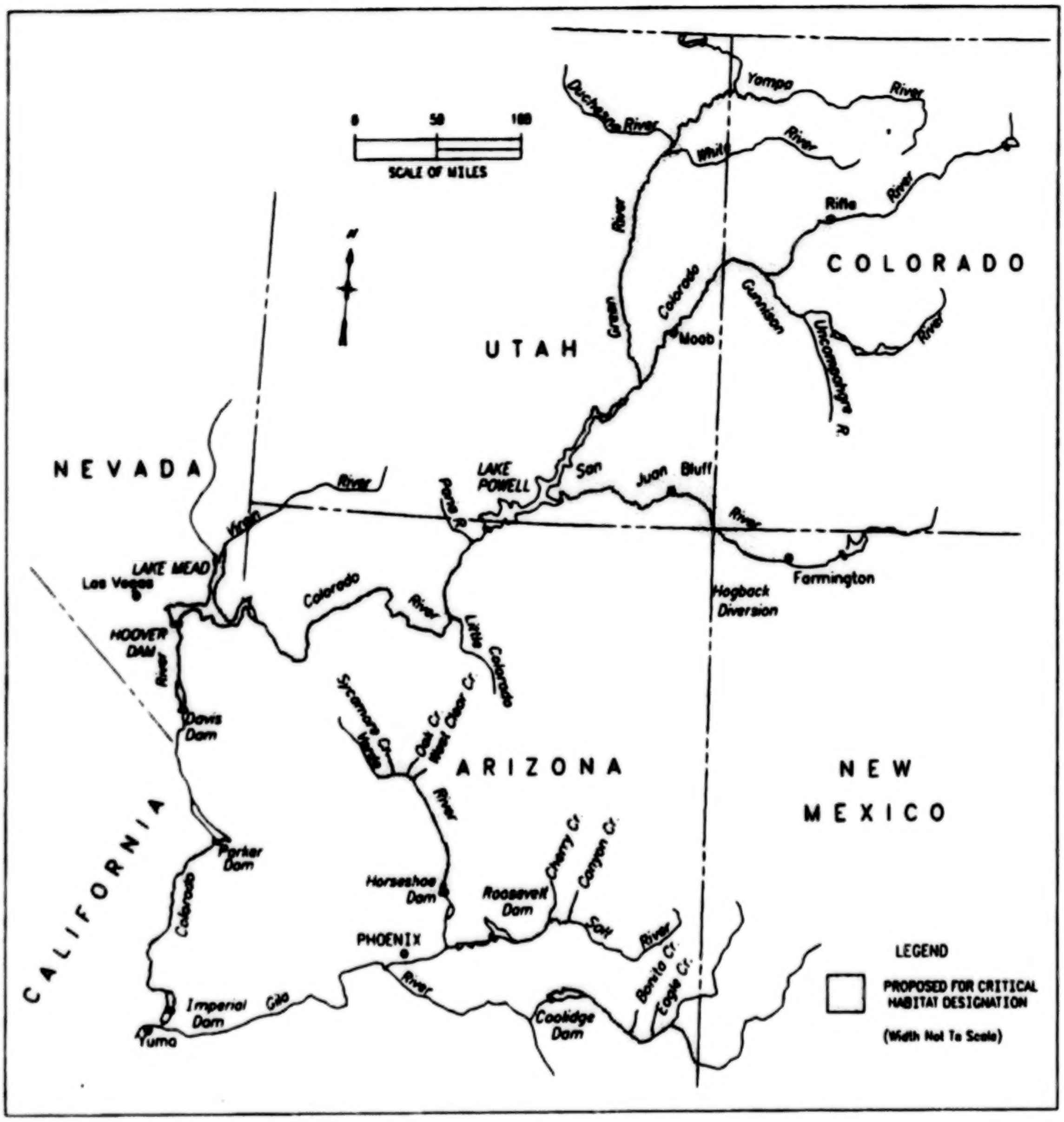

Figure II-5-2. Map of Proposed Critical Habitat for the Razorback Sucker.

3. Colorado Squawfish

The Colorado squawfish is endemic to the Colorado River Basin. It is the largest in size of four existing species of the genus Ptychocheilus. The Colorado squawfish is the largest member of the minnow family in North America, with maximum weights historically exceeding 80 lbs. Its origins predate recorded history, but by the mid-Pliocene epoch (about 6 million years ago) fossils indicate that early Ptychocheilus had riverine adaptations that were similar to modern forms. During the Pleistocene epoch (about 1 million years ago), an earlier wet climate was interrupted by periods of desert conditions. It has been hypothesized that the migrations reported for Colorado squawfish are a perfect life history strategy for the survival of a large predaceous fish in the historic Colorado River environment. During the spawning season, adult Colorado squawfish have been known to migrate up to 200 miles upstream or downstream to reach spawning areas. Colorado squawfish are adapted to rivers with seasonally variable flow, high silt loads, and turbulence.

Historically the Colorado squawfish occurred throughout the Colorado River Basin (Figure II-5-3). In the Lower Basin, Colorado squawfish were recorded in the Colorado River mainstem from the Gulf of California in Baja California del Norte to Lee's Ferry in Arizona; the Little Colorado River; the Gila River and its tributaries; and the San Pedro, Salt, and Verde rivers. Colorado squawfish also were recorded in the Salton Sea, which was sporadically filled with water from the Colorado River. In the Upper Basin, Colorado squawfish have been captured in the lower reaches of the Gunnison, White, Yampa, Little Snake, Dolores, San Juan, Duchesne, Uncompahgre, and Animas rivers, and Plateau Creek, a tributary of the Colorado River. The species also was common in the Colorado and Green Rivers mainstems, and probably in numerous smaller streams.

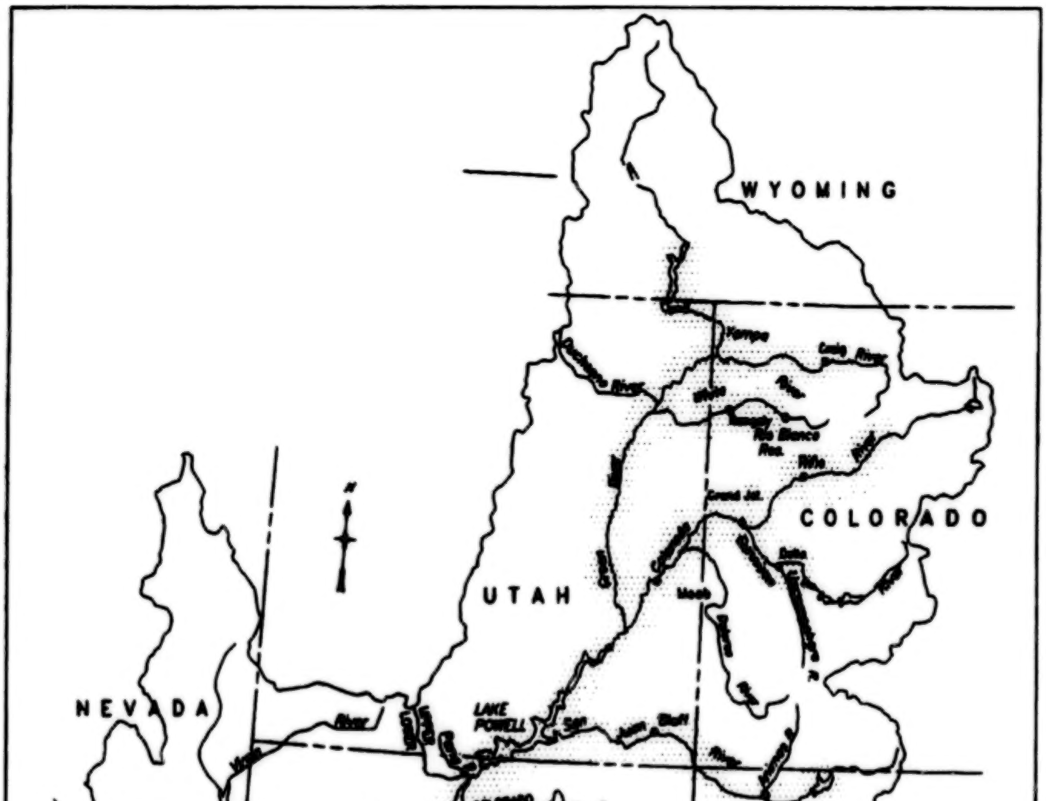

Figure II-5-3. Historical Distribution of the Colorado Squawfish. (Map adapted from the Colorado Squawfish Recovery Plan 1991)

Natural populations of the Colorado squawfish are restricted to the Upper Basin in Wyoming, Colorado, Utah, and New Mexico. The species occurs in the Green, Yampa, White, and Colorado rivers. Native Colorado squawfish populations have been extirpated from the Lower Basin. Catches of young, juvenile, and adult Colorado squawfish are higher in the Green River subbasin of Colorado and Utah than elsewhere. Recent investigations have found many young, juveniles, and adults in the Green River from the mouth of the Yampa River to its confluence with the Colorado.

Adult Colorado squawfish have been captured in the lower 124 miles of the Yampa River and in Lodore Canyon of the Green River, and larvae were identified in the lower 19 miles of the Yampa River in Dinosaur National Monument. Two adult Colorado squawfish implanted with radio transmitters ascended the Little Snake River in 1988. Investigation of the Green and Little Snake rivers in Wyoming in 1986 failed to produce any Colorado squawfish; however, an adult was found in the Little Snake River in Wyoming in 1990.

Colorado squawfish have been found in the lower 151 miles of the White River in Utah and Colorado. In the Duchesne River, a fisherman caught a Colorado squawfish at the mouth of the Uinta and Duchesne rivers in 1975, and a specimen implanted with a radio transmitter ascended the Duchesne River in 1980. A small reproducing population of Colorado squawfish exists in the San Juan River. A single juvenile squawfish was captured in the San Juan River just below the river's confluence of McElmo Creek near Aneth, Utah, in 1978.

In the Lower Basin, the Colorado squawfish is considered extirpated from the Gila River system, including all Arizona waters except those above Glen Canyon Dam. No Colorado squawfish (other than stocked fish) have been taken from the Gila River Basin since 1950. The last known adult Colorado squawfish from the Lower Basin was taken by a fisherman in 1975 from the mouth of Havasu Creek.

Once very common throughout the Colorado River Basin, Colorado squawfish populations have declined from historic levels. Its present range is restricted to the Upper Basin, though

Colorado squawfish have been reintroduced in the Salt and Verde rivers in Arizona. As with the other three endangered fishes, the decline of Colorado squawfish populations is due to various human-initiated physical and biological changes in the Colorado River.

Migration is an important component in the reproductive cycle of Colorado squawfish. Migration clues, such as high spring flows, increasing river temperatures, and possible chemical inputs from flooded lands and springs were important to successful reproduction. Radiotelemetry studies and collections of spawning fishes have added to the knowledge of Colorado squawfish spawning activities, seasonal movements, and habitat use. During the spawning season, adult Colorado squawfish have been known to migrate up to 200 miles upstream or downstream to reach spawning areas in the Green River Basin. Fidelity to spawning locations have been indicated for Colorado squawfish in the Green, Yampa, and Colorado rivers.

USFWS is proposing 6 reaches of the Colorado River system (Figure II-5-4) for designation as critical habitat for the Colorado squawfish. In the Upper Basin, critical habitat is being proposed in the Green, Yampa, Colorado, White, Gunnison, and San Juan rivers. No critical habitat for the Colorado squawfish is currently being proposed for the Salt and Verde rivers in the Lower Basin due to the presence of nonessential experimental populations in those rivers. Should that status change, these areas will need to be reviewed for possible inclusion as critical habitat.

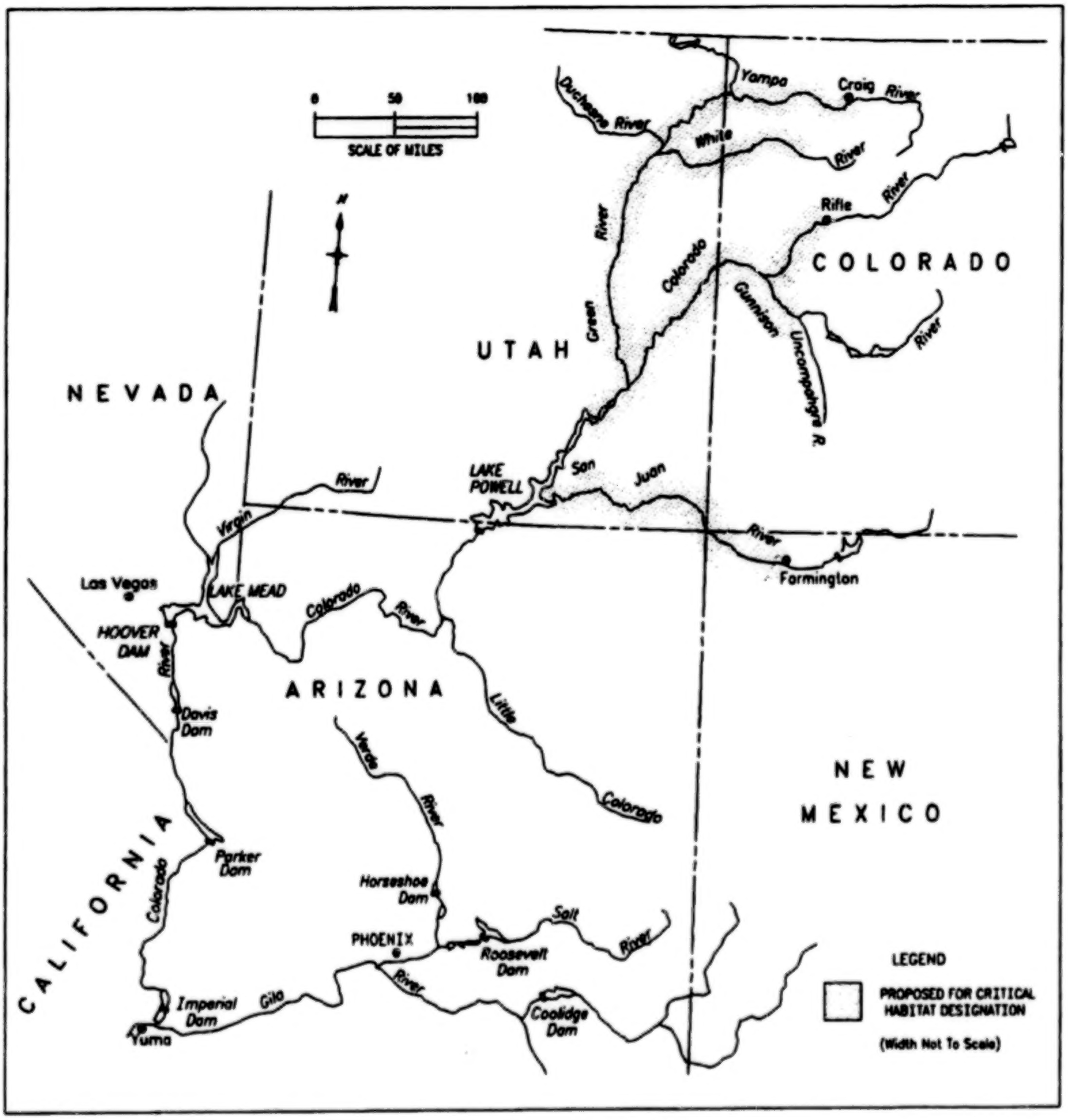

Figure II-5-4. Map of Proposed Critical Habitat for the Colorado Squawfish.

Of the historical range of Colorado squawfish, 29 percent is proposed for designation as critical habitat.

4. Humpback Chub

The humpback chub is endemic to the Colorado River Basin, and is part of a native fish fauna that can be traced in fossil records to the Miocene epoch. Humpback chub remains have been dated to about 4000 B.C., but the fish was not described as a species until recent times. This recent discovery has been attributed to its restricted distribution in remote, white water canyons.

Historic distribution of the humpback chub includes portions of the mainstem Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado rivers (Figure II-5-5). However, its original distribution throughout the Colorado River Basin is not known with certainty. Considerable manmade alteration occurred in the Colorado River before the 1940s, especially in the Lower Basin, and humpback chub may have disappeared from some river reaches before their existence was documented. Until the 1950s, the humpback chub was known only from Grand Canyon, where the largest population remains. A number of surveys were made in the Upper Basin in the 1950s and 1960s, primarily in conjunction with pre- and post-impoundment studies of Flaming Gorge Reservoir. Humpback chub subsequently were found in the upper Green River.

The largest populations of the humpback chub occur in the Little Colorado and Colorado rivers in the Grand Canyon and in the Black Rocks area of the Colorado River. Other populations have been reported in Westwater, Cataract and Debeque canyons of the Colorado River, Desolation and Gray canyons of the Green River, and Yampa and Whirlpool canyons in Dinosaur National Monument.

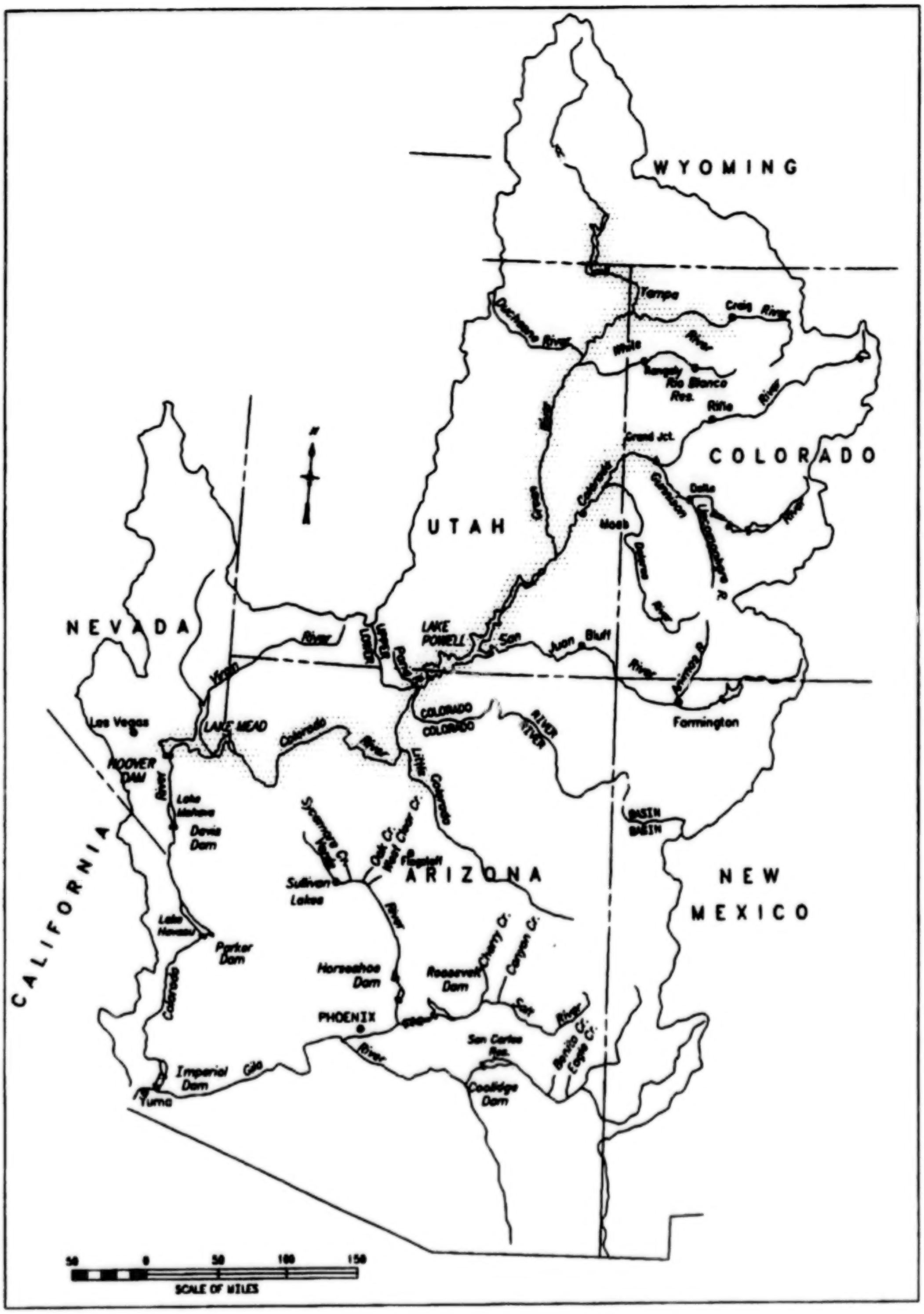

Figure II-5-5. Historical Distribution of the Humpback Chub. (Map adapted from the Humpback Chub Recovery Plan USFWS 1990b)

The present distribution of humpback chub reported in the Humpback Chub Recovery Plan includes the lower 8 miles of the Little Colorado River, Arizona; the Colorado River in Marble and Grand canyons, Arizona; Cataract and Westwater canyons in Utah; and the Black Rocks reach in Colorado. Humpback chub also occur in the Green River in Desolation and Gray canyons, Utah; and in the Yampa and Green rivers in Dinosaur National Monument, Colorado and Utah. More recent intensive research has better defined their distribution, which includes approximately 13 miles of the Little Colorado River up to Blue Springs. Additionally, concentrations of humpback chub have been collected in the vicinity of Pumpkin Springs in the Grand Canyon.

In the Lower Basin, the Little Colorado River in Grand Canyon contains the largest population of humpback chub and is the main reproduction area of humpback chub in the Grand Canyon region. Researchers working on the Colorado and Little Colorado rivers in the Grand Canyon have collected over 21,000 specimens of adult and juvenile humpback chub since 1987. Collections made in mainstem backwaters suggest that these habitats serve as important rearing areas for young-of-year humpback chub. The cold tailwaters of the dam and fluctuating flows have apparently caused major reductions in both the distribution and abundance of humpback chub in Marble and Grand Canyons. Humpback chub were collected in Lake Powell after closure of the dam in the 1960s, but only young-of-year fishes at the inflow area have been collected recently.

In the Upper Basin, the highest known concentrations of humpback chub are found in the Black Rocks and Westwater Canyon reaches of the Colorado River near the Colorado/Utah State line. Past studies indicate that there is a small population of humpback chub in Cataract Canyon. Although actual spawning has not been documented, the presence of various size humpback chubs, including young-of-year fishes, through the 12-mile reach of Cataract Canyon supports the hypotheses that spawning occurs there. Specimens also have been collected from the Colorado River in Professor Valley above Moab, in Elephant Canyon about 2 miles above the confluence with the Green River, and in the inflow area of Lake Powell.

This species is most often found in relatively inaccessible canyons, so it is not surprising that the species remained undiscovered until after World War II when the use of rubber rafts allowed easier access to canyon areas for sampling and research. The few remaining populations of humpback chub are limited to remote reaches in canyon areas of the Colorado River Basin. This species decline, like the other Colorado River endangered fishes decline, is attributed to streamflow alteration, competition, increased predation, and its hybridization with other members of the genus Gila.

Generally, humpback chub show fidelity for canyon reaches and move very little. In the Grand Canyon, humpback chub move from the main channel Colorado River into the Little Colorado River to spawn. Juvenile fishes have been collected about 160 miles below the Little Colorado River.

USFWS is proposing 7 reaches of the Colorado River system (Figure II-5-6) for designation as critical habitat for the humpback chub. In the Upper Basin, critical habitat is being proposed in the Green, Yampa, and Colorado rivers. Portions of the Colorado and Little Colorado rivers are being proposed in the Lower Basin. Of the historical range of humpback chub, 28 percent is proposed for designation as critical habitat. These reaches include all known major populations of humpback chubs. Humpback chub once occupied more habitat in the Upper Basin. Approximate equal amounts of Upper (166) and Lower Basin (182) river miles have been proposed.

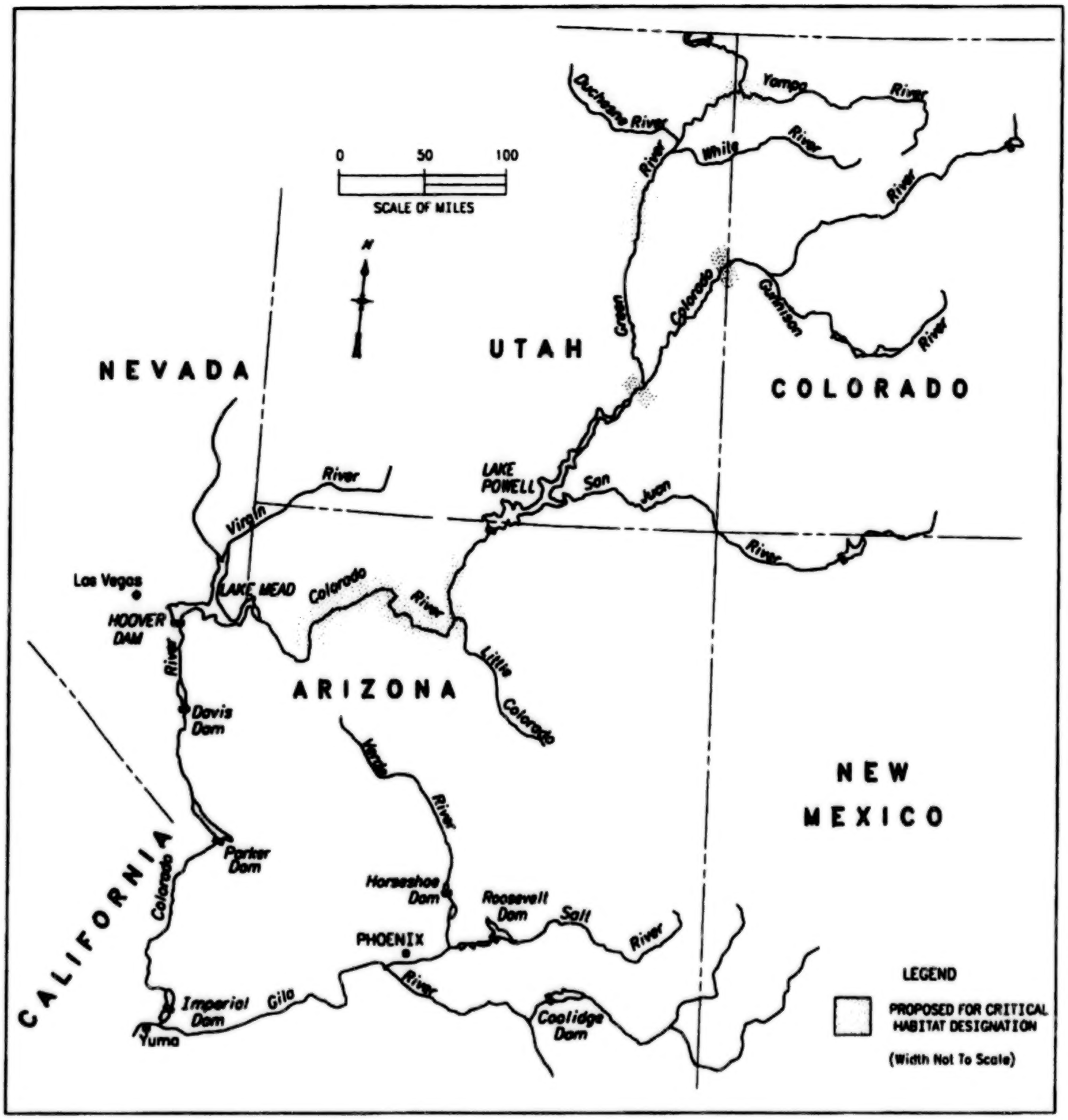

Figure II-5-6. Map of Proposed Critical Habitat for the Humpback Chub.

5. Bonytail

The bonytail is the rarest native fish in the Colorado River. Formerly reported as widespread and abundant in mainstream rivers, its populations have been greatly reduced. The fish is presently represented in the wild by a low number of old adult fishes (i.e., fish 40 years or more in age) in Lake Mohave and perhaps other Lower Basin reservoirs. The fish were once common in Lake Mohave. A few individuals were reported in other locations, but concentrations of the fish have not been recently reported.

The historical range of the bonytail encompassed much of the Colorado River Basin (Figure II-5-7). The original records of bonytail were from the Colorado and Gila Rivers. However, the type locality of the bonytail was presented as the Zuni River of New Mexico. Captures in the Green River indicate bonytail were present in southern Wyoming in the area now inundated by Flaming Gorge Reservoir, in Dinosaur National Monument in Colorado and Utah, in Desolation and Gray canyons in Utah, and in the lower Green River in Utah. In the Colorado River, they were collected from near Grand Junction, Colorado, downstream to the Gulf of California. Major tributaries of the Colorado River where bonytail were recorded included the Gila, Salt, and Verde rivers in Arizona and the Gunnison River. The species also entered the Salton Sea Basin in California when that area received Colorado River inflow during 1905-1907, but disappeared when salinity became intolerable.

Few sightings of bonytail were reported for the Upper Basin in the first half of the twentieth century. The species declined in the Lower Basin during this time, disappearing from the Salt and upper Gila rivers before 1926. Soon after closure of Glen Canyon Dam in 1962, bonytail were reported in Lake Powell and downstream of the dam to Lee's Ferry (Arizona State University museum records 1963-1965). "Older" fishermen reported that bonytail were caught in the upper Green River during the 1940s and 1950s. However, the last known riverine area where bonytail were common was the Green River in Dinosaur National Monument.

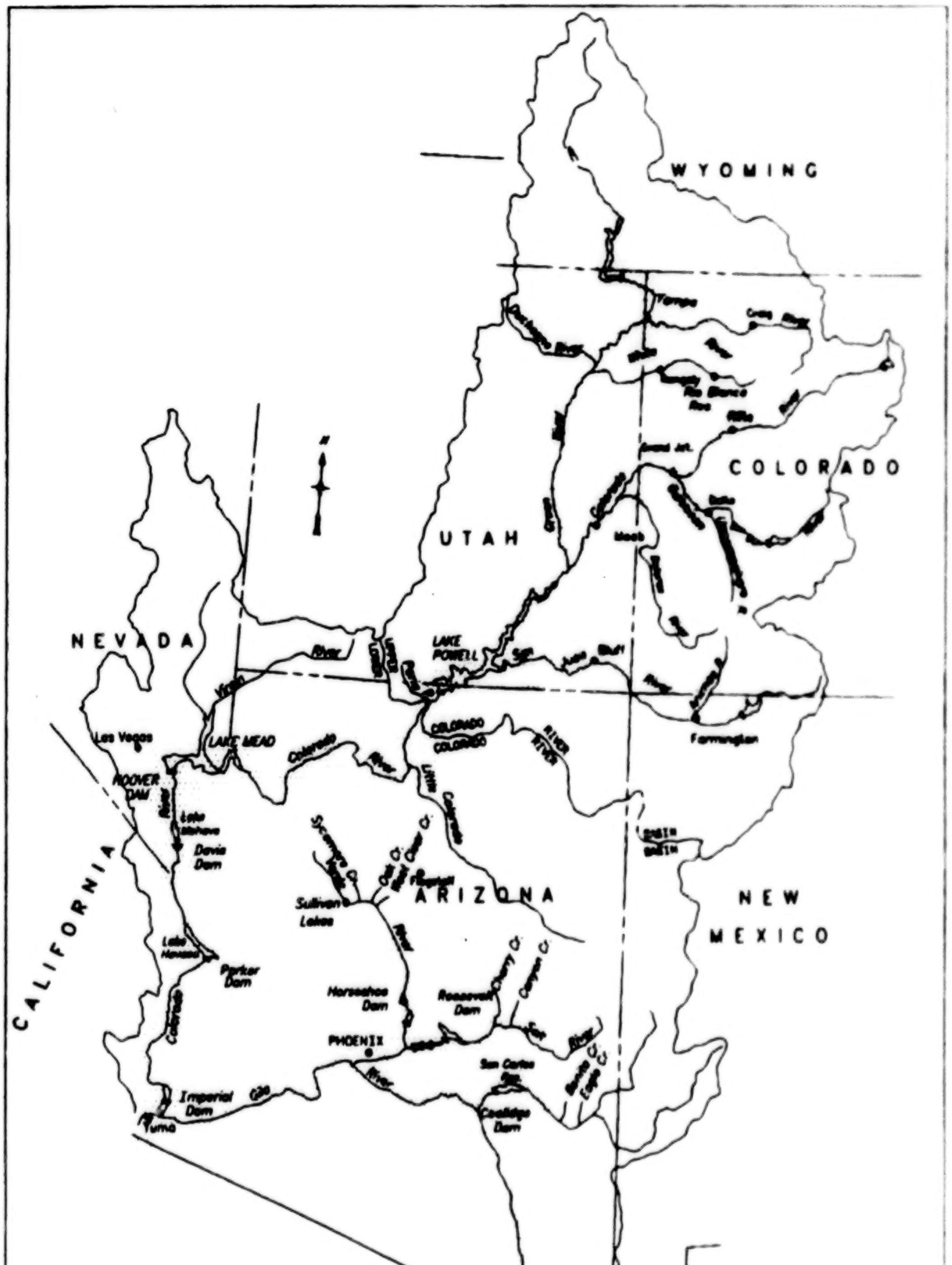

Figure II-5-7. Historical Distribution of the Bonytail.
(Map adapted from the Bonytail Chub Recovery Plan USFWS 1990a)

The bonytail now is very rare. In the Lower Basin, individual fish still are taken occasionally by fishermen in Lake Havasu. Also, a few large, old adults are still found in Lake Mohave, but no successful reproduction has been documented there. A total of 32 adult specimens were collected by biologists from Lake Mohave from 1974 to 1987, and several more were reported by anglers. An additional 16 fishes were collected from Lake Mohave in 1988 and 1989. The bonytail was common in the Green River below the Yampa River confluence after Flaming Gorge became operational in 1962.

USFWS is proposing 6 reaches of the Colorado River system (Figure II-5-8) for designation as critical habitat for the bonytail. In the Upper Basin, critical habitat is being proposed in the Green, Yampa, and Colorado rivers. A reach of the Colorado River is being proposed in the Lower Basin. Of the historical range of bonytail, 15 percent is proposed for designation as critical habitat. As more life history and habitat information becomes available, other areas not proposed may be found important may and contribute to the conservation of this species. Bonytail are believed to have been common in the Colorado River and its large tributaries throughout the system. One hundred sixty six miles in the Upper Basin and 286 miles in the Lower Basin are proposed as critical habitat for the bonytail.

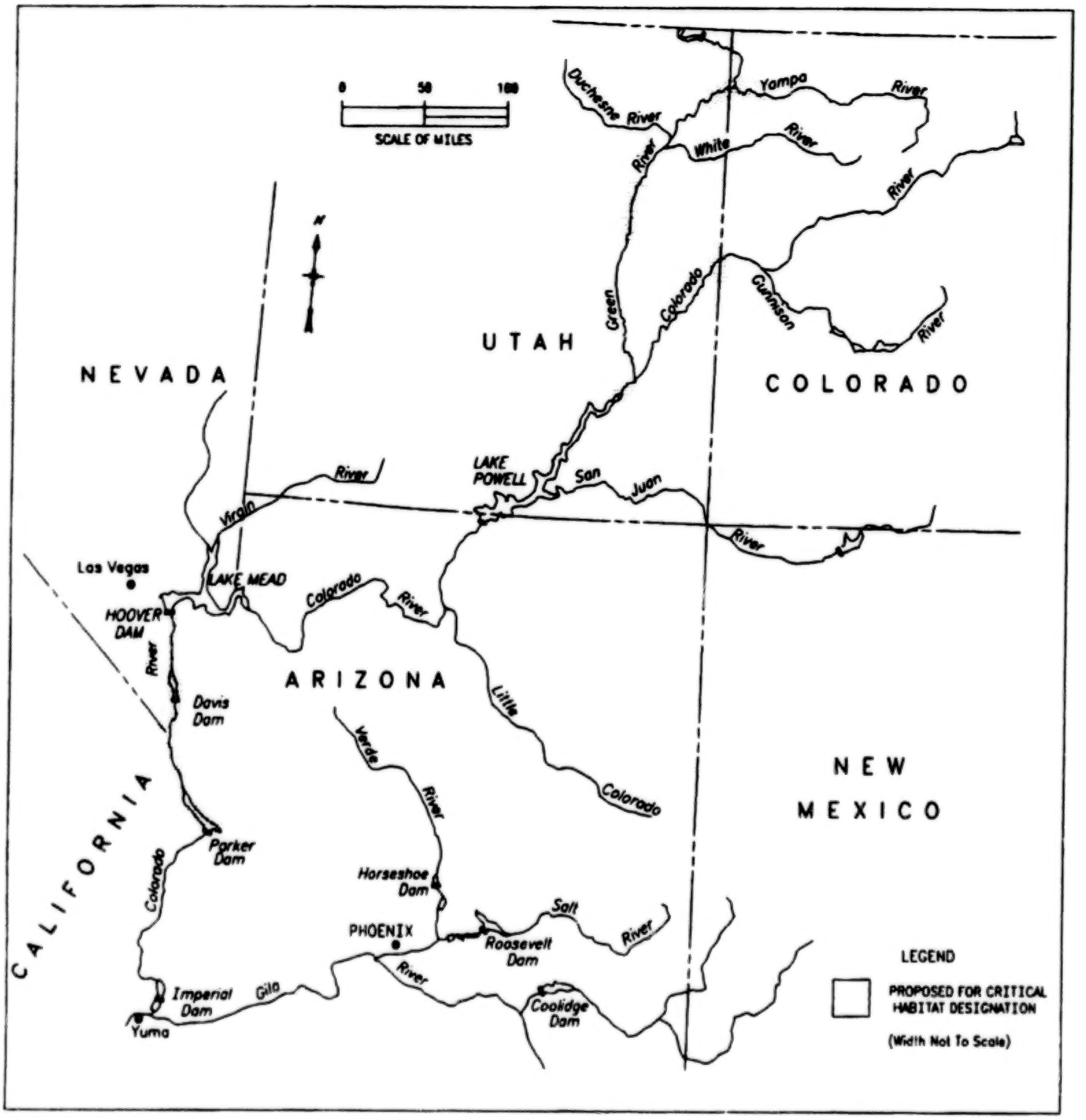

Figure II-5-8. Map of Proposed Critical Habitat for the Bonytail.

Volume II

Chapter 6: Hydrograph: Methods, Historical and Recommended Flows[6]

A. Overview of Analysis

For the Colorado River fishes, flows believed necessary for conservation of these species are key to the economic analysis. The purpose of this chapter is to compile and present flow recommendations for use in economic analysis of critical habitat designation. These flow recommendations are based upon the best information currently available. Recommendations were taken from Yampa, Green, Colorado, Gunnison, and San Juan reports and biological opinions where available. For most of the tributary streams and rivers, flow recommendations are not available, and no studies are being planned to collect information needed to develop recommendations (although recommendations for the Gila, Salt, and Verde rivers may be developed at a later date). For sections of mainstem rivers (e.g., lower Green, Gunnison, San Juan, White, and Colorado below the Gunnison and below Glen Canyon Dam), studies are planned or are underway to determine flow needs, but results will not be available for several years. Designation of critical habitat, however, cannot be postponed until all studies have been completed. Therefore, flow recommendations in this report are to be considered solely for use in economic analysis at this time, in order to meet legally mandated deadlines during the process of critical habitat designation.

This chapter includes flow recommendations for each of twelve gage locations within the Colorado River Basin. Ten sites are located in the Upper Basin, and two are located in the Lower Basin. Although the analyses were conducted using daily and weekly flow data, this report contains only a summary of those data. All other data that were used in the analyses, however, are available for inspection.

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[6] This chapter was prepared by USFWS and Bureau of Reclamation personnel.

B. Methods

The following section applies primarily to methods used for analyses of the ten Upper Basin sites. The two sites in the Lower Basin were handled differently for a number of reasons. The Glen Canyon Dam recommendations were taken from the Preliminary Draft Environmental Impact Statement developed by the Bureau of Reclamation (1993), and different methods were used in development of their flow recommendations than were used in this analysis. Flow recommendations for management of Lake Mohave are unique in that flow releases from two dams will need to be synchronized to manage reservoir levels.

Biological flows were developed by the USFWS. These flows were adjusted by the Bureau of Reclamation to fit their Colorado River Simulation System (CRSS) model and physical limitations at their facilities. The methods presented herein are how the biological flows were developed. The figures are results of Bureau of Reclamation CRSS runs and may vary somewhat from the biological flow recommendations.

1. Selection of Sites

To represent occupied habitat of the Colorado River Basin, twelve sites were selected for the analysis (Figure II-6-1); ten in the Upper Basin[7] and two in the Lower Basin. Following are the selected Upper Basin sites and associated U.S. Geological Survey (USGS) gage station identification numbers:

1. Yampa River at Deerlodge Park (09260050)
2. Green River near Jensen (09261000)
3. White River near Watson (09306500)
4. Green River at Green River (09315000)
5. Colorado River near Cameo (09095500)
6. Gunnison River near Grand Junction (09152500)
7. Colorado River near Utah-Colorado Stateline (09163500)

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[7] San Juan at Archuletta was not utilized.

8. Colorado River near Cisco (09180500)
9. San Juan River at Shiprock (09368000)
10. San Juan River near Bluff (09379500)

The Lower Basin sites selected for critical habitat recommendations include:

1. The Colorado River at Lee's Ferry, and
2. Lake Mohave (not shown in Figure II-6-1).

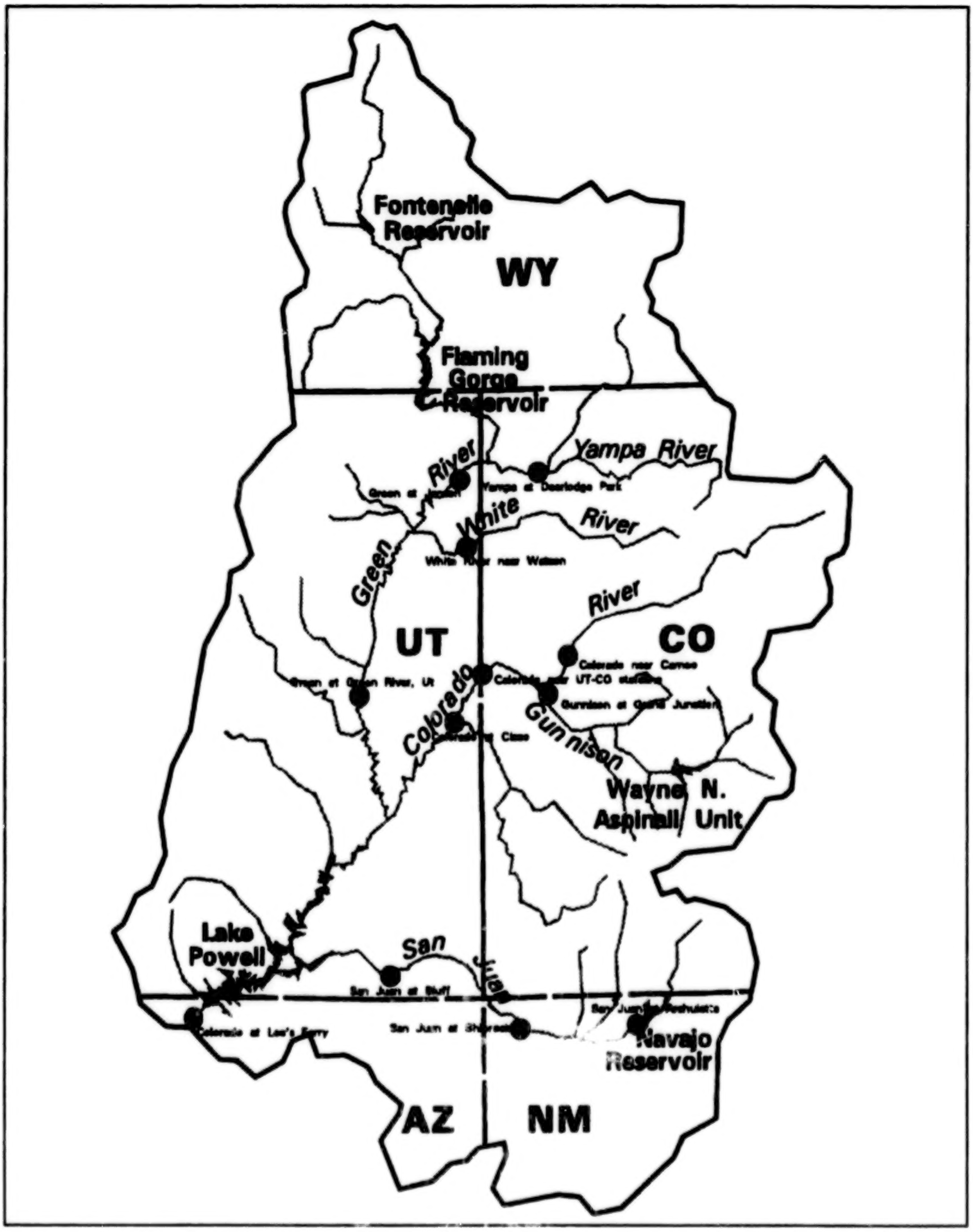

Figure II-6-1. Sites Used for Economic Analysis of Critical Habitat within the Upper Colorado River Basin.

2. Selection of Period of Record

The purpose of the analysis was to compare Colorado River Basin flows with and without endangered species (i.e., to compare the actual measured flows which occurred at each location with the flows which would have been recommended for endangered fishes). The years selected for the hydrological analysis were 1967 through 1985. Flaming Gorge Reservoir finished filling during 1966, after which the reservoir began normal (without-endangered-species) operations. The endangered fishes did not become a factor until 1986, when the reservoir began releasing experimental flows for the endangered fishes, thereby deviating from normal operations. Although other Upper Basin mainstem rivers (e.g., the Gunnison River) are unaffected by Flaming Gorge operations, the same time period was selected for all USGS gages, for purposes of comparison and to be consistent throughout the analysis. Therefore, 1967-1985 period is defined as the time period, post-development, during which flows throughout the Upper Basin were unaffected by the endangered fishes.[8]

3. Selection of Time Step

A weekly time step was considered to be of sufficient accuracy and resolution without requiring excessive computation or producing voluminous output. The CRSS model used by the Bureau of Reclamation, however, required monthly values for determination of impacts of recommended flows on hydroelectric generation and, in part, on agricultural uses. Therefore, the analyses required both weekly and monthly flow data. This chapter includes only the annual and monthly summaries of those data.

4. Measured Flows

Flow values are based on published USGS flows measured at the gage stations for the 1967-1985 time period. In two cases (the Yampa River at Deerlodge and the White River near Watson), the hydrologic data had to be synthesized for missing portions of the period of record. Beginning with January 1, 1967, published daily flows were averaged for each 7-day period to yield a weekly flow value. Week #1 represents the first seven days of the year. Week #2 represents the second seven days, and so on. Flow values are displayed in cubic feet per second (cfs).

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[8] It is recognized this is a first approximation in that the 19 years may not exactly reflect long term hydrologic conditions in all of the different basins.

C. Recommended Flows

Approaches used in developing weekly and monthly values will be discussed separately for each of the ten USGS gage stations. For each weekly flow value, the recommended flow was subtracted from the measured flow to obtain the difference (in cfs). For each week, the difference in cfs was converted to volume in acre-feet (AF) using the equation:

$$\text{Volume(AF/Week)} = \text{(cfs)(7Days/Week)(1.9835AF/cfs/Day)}$$

For each year from 1967-1985, the weekly surpluses and shortages of water (in AF) were summed to display the annual totals. To summarize the results of the analyses for this report, weekly values were converted to monthly and annual values.

1. Yampa River at Deerlodge Park

Because the Deerlodge gage did not begin operation until 1982, the 1967-1985 measured flows for the Yampa at Deerlodge (Figure II-6-2) were calculated by adding gaged flows at Maybell to gaged flows from the Little Snake at Lily. Yampa River flow recommendations (USFWS 1990) were based on percent exceedance values of environmental flows for the 1930-1982 time period. For each year between 1967 and 1985, fifty percent exceedance values (median flow value) were used for August 2 through March 20; "percentile which occurs naturally" (i.e., environmental flows as of March 1990) were used for March 21 through August 1.

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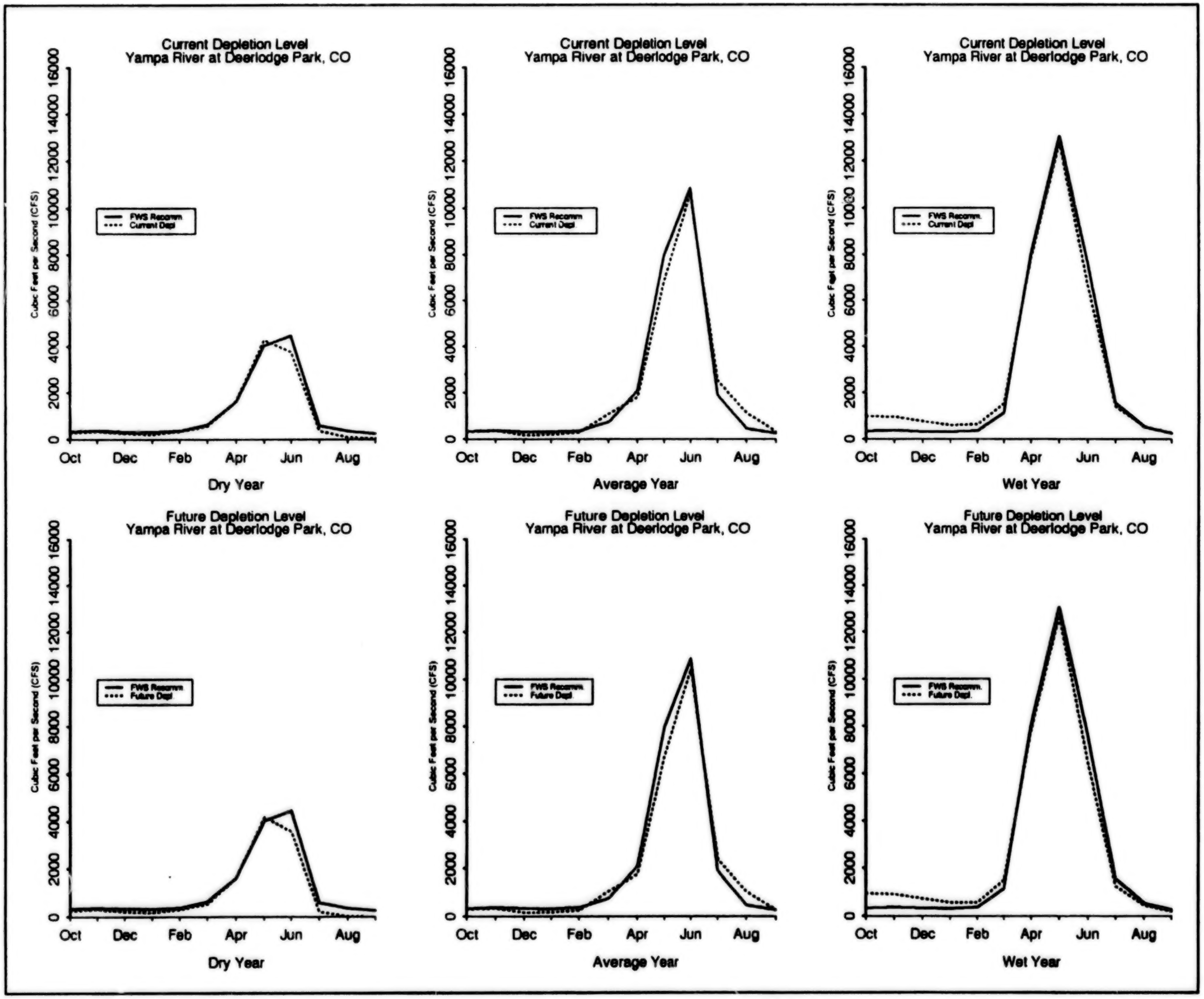

Figure II-6-2. Yampa River at Deerlodge Park, Colorado.

2. Green River near Jensen

Measured flows at Jensen (Figure II-6-3) were taken from USGS gage records for the calendar years 1967-1985. Recommended flows at Jensen are the sum of recommended Yampa flows and recommended Flaming Gorge releases (USFWS 1992). In weeks where the sum of recommended Yampa flows and minimum Flaming Gorge releases (800 cfs) exceeded Jensen flow recommendations, the Yampa flow recommendations were given higher priority (e.g., the sum of the recommended Yampa flow plus the minimum Flaming Gorge release of 800 cfs becomes the new base flow recommendation at Jensen, even if it exceeds the original 1,800 cfs that is recommended in the Flaming Gorge biological opinion).

Each year was categorized according to volume of spring runoff to achieve correspondence with the reasonable and prudent alternatives outlined in the biological opinion. Because the Green River is regulated by Flaming Gorge operations, Yampa flows were used to partition years. For the Yampa River, calendar years 1967-1985 were partitioned into wet, high average, low average, and dry years based on each year's April-July volume of water.

Years when April through July flow volumes exceeded the 80th percentile were considered wet years; years where volumes fell in the 55th to 80th percentile were considered high average years; years where volumes fell in the 30th to 55th percentile were considered low average years; and years where volumes fell below the 30th percentile were considered dry years. Dry years naturally seem to fall into a group by themselves, whereas the other years blend into a continuum (except for 1984).

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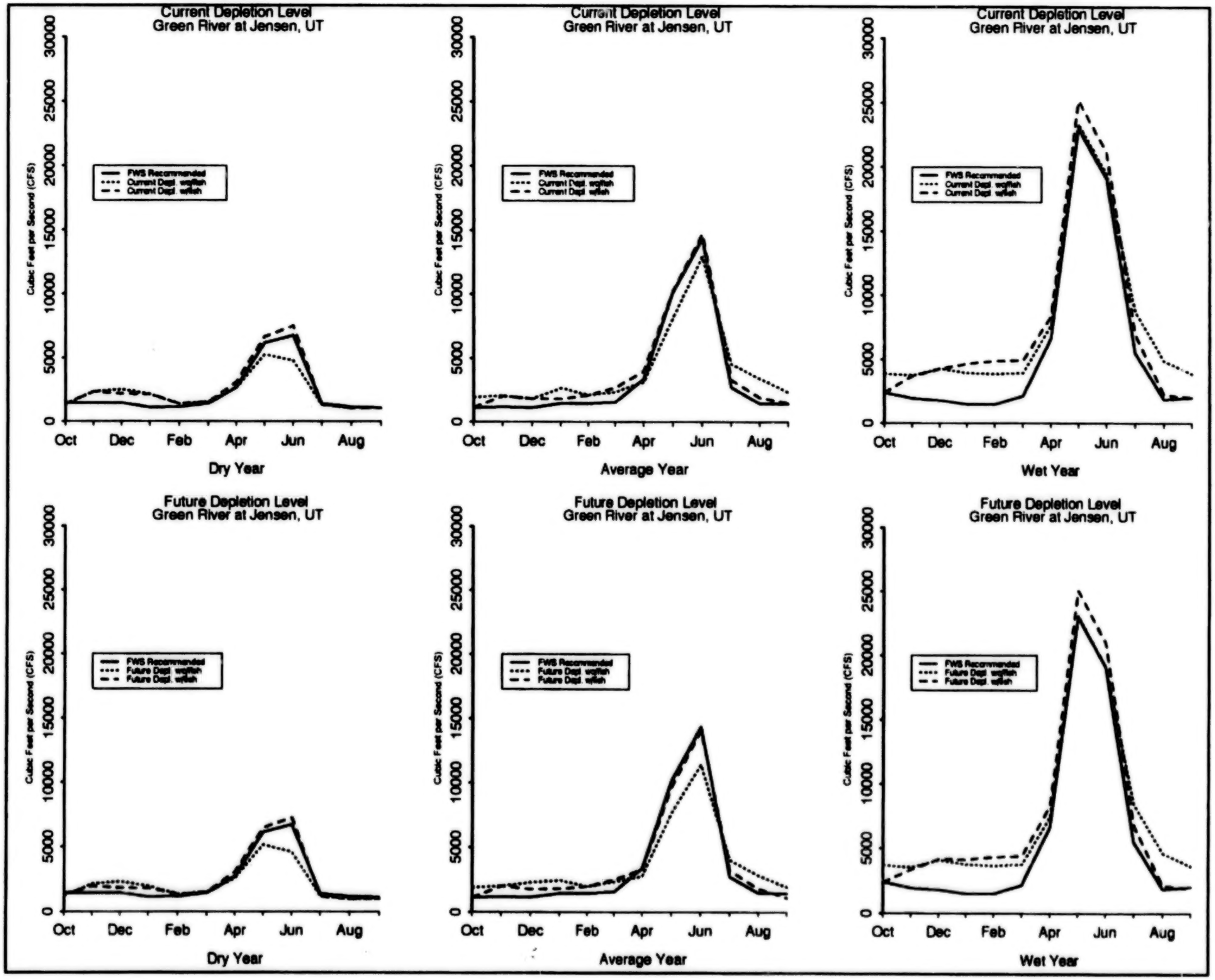

Figure II-6-3. Green River at Jensen, Utah.

a. Wet Years (1984, 1983, 1971, 1985)

The wet years have the following characteristics:

Peak releases from Flaming Gorge of 4,700 cfs for 4 weeks, the timing of which corresponds to the 4 consecutive weeks of highest Yampa River flows.

Flows of 1,800 cfs at Jensen, beginning July 16 (Week #29) when squawfish larvae begin to arrive in backwaters.

Flows of 2,400 cfs at Jensen, if necessary to manage Flaming Gorge storage, beginning September 17 (Week #38) and continuing through November 4 (Week #44).

Flows of 1,800 cfs at Jensen, beginning November 5 (Week #45) and continuing through April 1 (Week #13).

From April 2 (Week #14) through July 15 (Week #28), Flaming Gorge releases are increased gradually to peak releases of 4,700 cfs, and then decreased gradually to minimum releases of 800 cfs to pattern Jensen flows after Yampa flows.

b. High Average Years (1974, 1978, 1982, 1980, 1970)

The high average years have the following characteristics:

Peak releases from Flaming Gorge of 4,700 cfs for 3 weeks, the timing of which corresponds to the 3 consecutive weeks of highest Yampa River flows.

Flows of 1,450 cfs at Jensen, beginning July 9 (Week #28) when squawfish larvae begin to arrive in backwaters, and continuing through April 1 (Week #13).

From April 2 (Week #14) through July 8 (Week #27), Flaming Gorge releases are increased gradually to peak releases of 4,700 cfs, and then decreased gradually to minimum releases of 800 cfs, to pattern Jensen flows after Yampa flows.

c. Low Average Years (1979, 1973, 1975, 1968, 1969)

The low average years have the following characteristics:

Peak releases from Flaming Gorge of 4,700 cfs for 2 weeks, the timing of which corresponds to the 2 consecutive weeks of highest Yampa River flows.

Flows of 1,450 cfs at Jensen, beginning July 9 (Week #28) when squawfish larvae begin to arrive in backwaters, and continuing through April 1 (Week #13).

From April 2 (Week #14) through July 8 (Week #27), Flaming Gorge releases are increased gradually to peak releases of 4,700 cfs, and then decreased gradually to minimum releases of 800 cfs, to pattern Jensen flows after Yampa flows.

d. Dry Years (1967, 1976, 1972, 1981, 1977)

The dry years have the following characteristics:

Peak releases from Flaming Gorge of 4,700 cfs for 1 week, the timing of which corresponds to the 1 week of highest Yampa River flows.

Flows of 1,100 cfs at Jensen, beginning June 18 (Week #25) when squawfish larvae begin to arrive in backwaters, and continuing through April 1 (Week #13).

From April 2 (Week #14) through June 17 (Week #24), Flaming Gorge releases are increased gradually to peak releases of 4,700 cfs, and then decreased gradually to minimum releases of 800 cfs, to pattern Jensen flows after Yampa flows.

According to the Flaming Gorge biological opinion dated November 25, 1992, "A high release from Flaming Gorge Dam must be provided annually to obtain a target peak flow between 13,000 and 18,000 at Jensen...." Notice that peak flows at Jensen exceed 18,000 cfs in some years, and that Yampa peaks also exceed 18,000 occasionally. It is unknown if peak flows higher than 18,000 cfs are detrimental to the endangered fishes and their habitats.

Historically, Jensen and Yampa flows have exceeded 18,000 cfs. Also, Flaming Gorge Reservoir is forced to spill water when its storage capacity is exceeded. Therefore, Jensen flow recommendations were not capped at 18,000 cfs, as implied in the biological opinion.

3. White River near Watson

USGS flow records for the White River (Figure II-6-4) near Watson are not available for the October 1979 through September 1985 time period. To estimate flows, a comparison was made among measured flows at three White River gages for the time period when they were operating simultaneously (October 1976 through September 1979): the White River near the Colorado-Utah State line gage (09306395; River Mile 67.8), the White River near Watson (09306500; River Mile 59.3), and the White River at the mouth (09306900; River Mile 3.9). Flows measured at the White River near the Colorado-Utah State line were found to be similar (generally within 4 percent) of flows measured at the White River near Watson. Flows measured near the mouth of the White River were much more variable, up to 57 percent higher than those at Watson. Therefore, flows measured at the White River near the Colorado-Utah State line were used to fill data gaps for the October 1979 through September 1985 time period at the White River near Watson.

No formal flow recommendations have been developed for conservation of endangered fishes in the White River. USFWS will be conducting studies through 1994 that may yield information for use in recommending flows. In the meantime, flow recommendations are needed for economic analysis of critical habitat. Based on the assumption that the flows which occurred in the White River during the 1967-1985 time period were not detrimental to resident and migrating adult and juvenile Colorado squawfish (Biological Sub-Committee 1984), the flows measured during that time period are considered to be the flows recommended for that time period. No biological justification for recommending greater or lesser flows was apparent.

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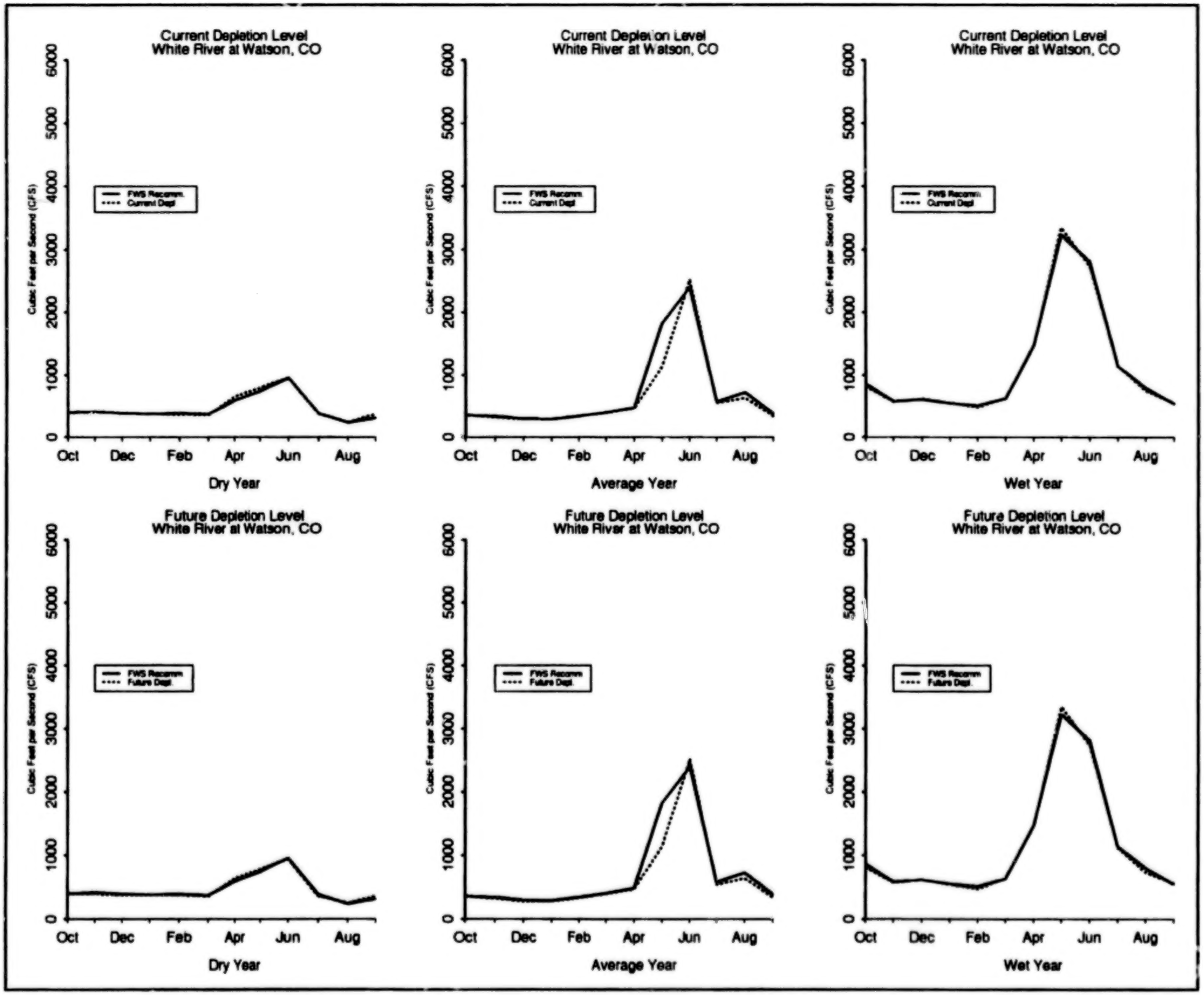

Figure II-6-4. White River at Watson, Colorado.

4. Green River at Green River, Utah

Flow recommendations for the Green River (Figure II-6-5) at Green River were calculated by adding the 1967-1985 measured flows for the Duchesne and Price River to the recommended flows for the White River near Watson and the Green River near Jensen. Studies being conducted to refine Green River flow recommendations, scheduled for completion by 1996, will likely alter the preliminary recommendations presented here.

5. Colorado River near Cameo

Recommendations for the Colorado River near Cameo (Figure II-6-6) were derived by adding Grand Valley diversions to the 15-mile reach flow recommendations, and subtracting flows measured at Plateau Creek (Osmundson and Kaeding 1991). The purpose is to ensure that flows are available to achieve 15-mile reach flow recommendations after water has been diverted below Cameo. For weeks which occurred during the spring, monthly corrections to account for diversions were added to 15-mile reach recommendations, using the equation:

$$\text{Cameo Rec.} = \text{15 mile Rec.} - \text{Plateau} + \text{correction factor}$$

and correction factors of 1,150 cfs for April, 1,450 cfs for May, and 1,500 cfs for June. For weeks which occurred during July through October, diversions were calculated using the equation:

$$\text{Diversions (cfs)} = (\text{Cameo} + \text{Plateau}) - \text{15 mile}$$

where 15-mile reach estimated flow values were obtained in Osmundson and Kaeding (1991). The table contains calculated mean monthly flows for the Colorado River at the top of the 15-mile reach. Once diversions were calculated, then Cameo flow recommendations were calculated using:

$$\text{Cameo Rec.(cfs)} = (\text{15 mile Rec.} + \text{Diversions}) - \text{Plateau}$$

For the non-irrigation season (November through March), Cameo flow recommendations are simply the sum of 15-mile reach flow recommendations and Plateau Creek measured flows.

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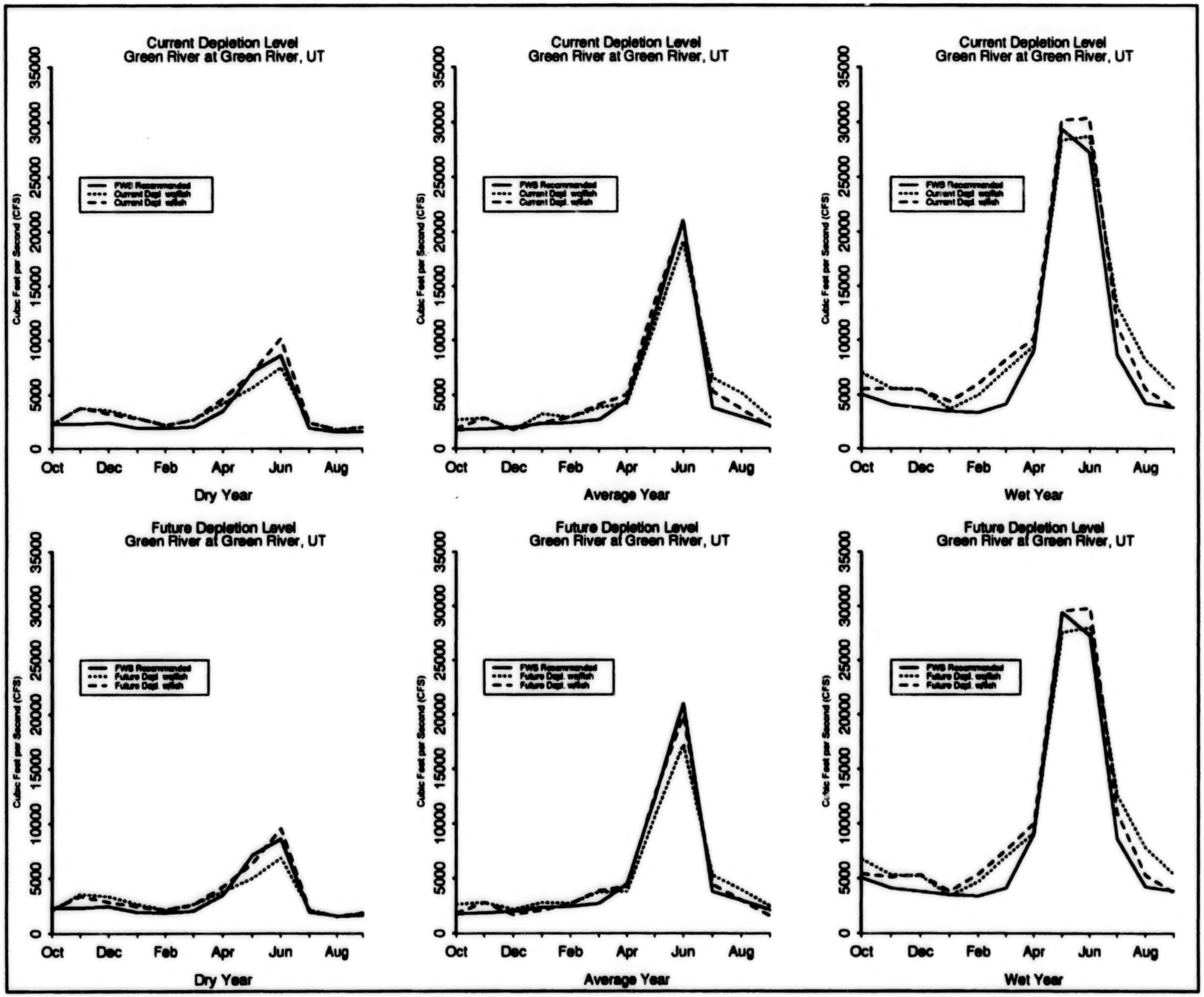

Figure II-6-5. Green River at Green River, Utah.

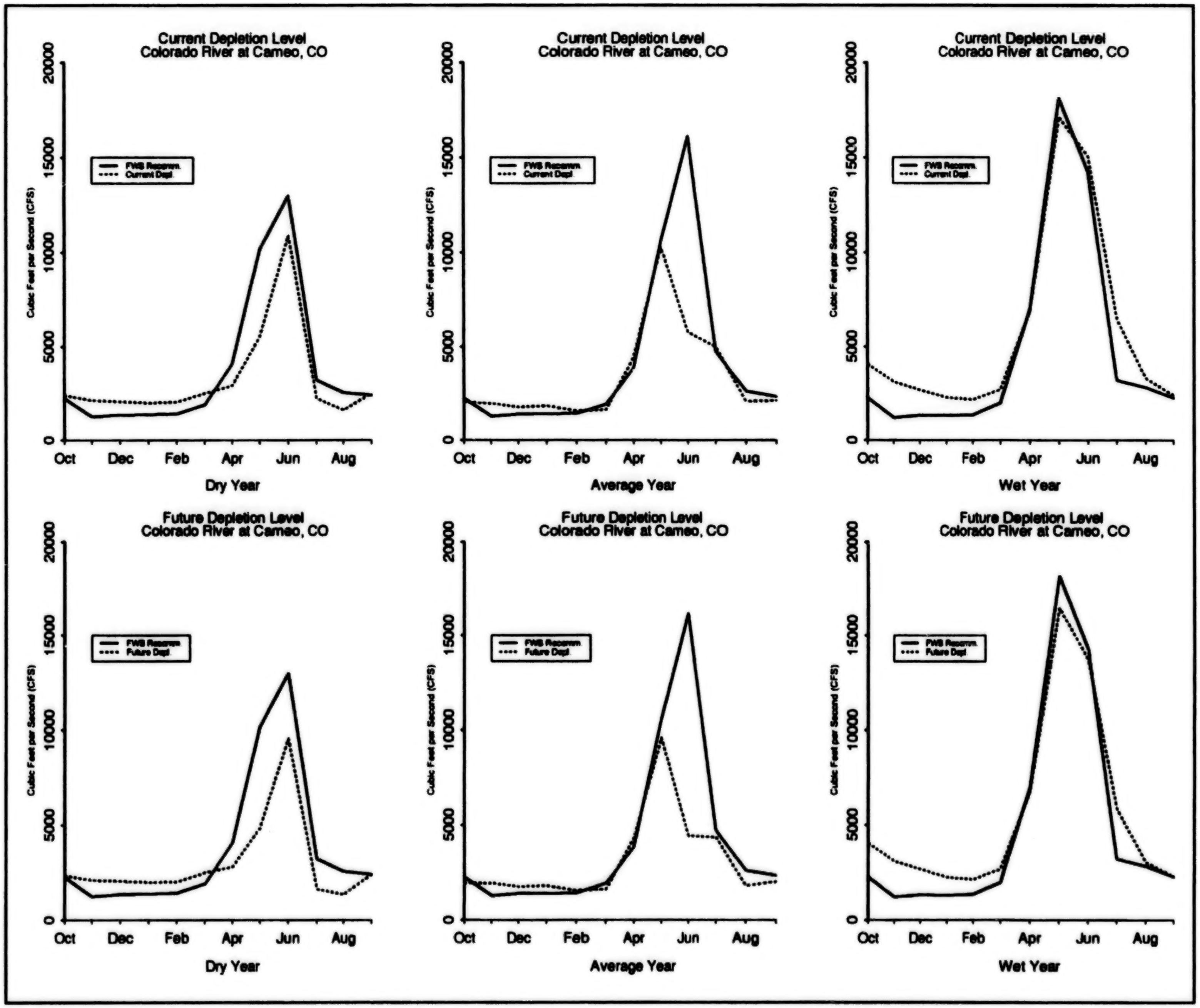

Figure II-6-6. Colorado River at Cameo, Colorado.

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6. Gunnison River near Grand Junction

Studies are underway to determine flow and habitat needs for conservation of endangered fishes in the Gunnison River (Figure II-6-7). To support these studies, the Bureau of Reclamation is releasing a range of test flows from the Aspinall Unit to help determine flow regimes most beneficial to endangered fishes. Flow recommendations based on these studies will not be available until at least 1997.

It appears that razorback suckers and Colorado squawfish were doing well in the Gunnison until at least 1950 (based primarily on anecdotal information). Razorback suckers were considered "common" to "abundant," and Colorado squawfish were considered "common." According to references in McAda and Kaeding (1991), a commercial fisherman frequently collected both razorbacks and squawfish in the Gunnison between 1930 and 1950. Since 1992, five adult Colorado squawfish have been captured in the Gunnison River. Therefore, the preliminary Gunnison River flow recommendations for economic analysis of critical habitat in this report are based on the assumption that conditions that existed prior to Aspinall were sufficient to support populations of Colorado squawfish and razorback suckers.

Recommendations were based on flows which occurred in the Gunnison River near Grand Junction during the 1937 to 1965 time period, corresponding to the pre-Aspinall "middle development period" described in McAda and Kaeding (1991). For the 1937 to 1965 time period, and for the 1967 to 1985 time period, annual flow volumes were sorted into percentiles. The mean weekly and monthly flows of the fifth percentile flow year from the 1937-1965 time period (i.e., the average between 1954 and 1963) were then recommended for the fifth percentile flow year from the 1967-1985 time period (i.e., 1977); flows of the 10th percentile flow year (i.e., 1959) were recommended for the corresponding 10th percentile flow year (i.e., 1981); 15th percentile for 15th percentile; and so on.

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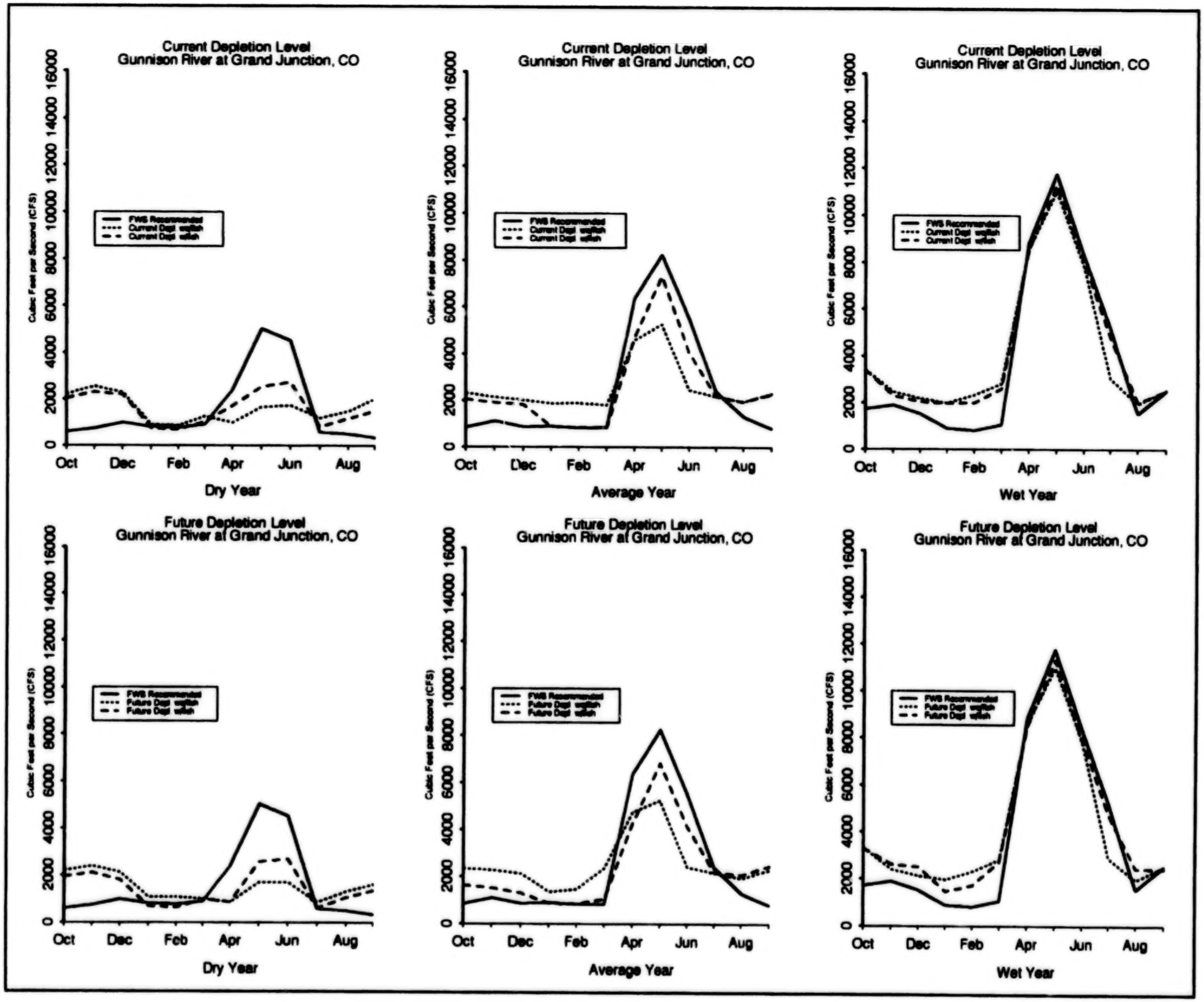

Figure II-6-7. Gunnison River at Grand Junction, Colorado.

The dates during which peak flows occurred differed among corresponding percentile flow years, which created problems in meeting Colorado River flow recommendations. To rectify the problem, spring flow values for the Gunnison River from the 1937 to 1965 time period were reordered to smooth the hydrograph and to match the timing of peak flows at the Colorado River near Cisco for the 1967 to 1985 time period.

7. Colorado River near the Colorado-Utah State Line

Recommendations for the Colorado River at State Line (Figure II-6-8) were derived by adding flow recommendations for the Gunnison River near Grand Junction to the flow recommendations for the 15-mile reach of the Colorado River (Osmundson and Kaeding 1991; and Kaeding and Osmundson 1989). For the 15-mile reach of the Colorado River, flow recommendations were derived from the Colorado River reports:

Nov-Feb: 1,470 cfs (Osmundson and Kaeding 1991)
Mar: 2,006 cfs (Ibid)
Apr-Jun: Variable (Ibid)
Jul-Sep: 1,000 cfs (Kaeding and Osmundson 1989)
Oct: 1,000 cfs (Osmundson and Kaeding 1991)

For the April through June flow recommendations for the 15-mile reach, calendar years 1967 through 1985 were partitioned into 0-50th, 50th-75th, and 75th-100th percentiles based on estimated total annual volume of natural flows for each of those years. Years in which flow volumes fell within the 0-50th percentile were assigned a flow recommendation of 2,800 cfs for April, 9,550 for May, and 11,400 for June; recommendations for 50-75th percentile years were 3,550 for April, 11,850 for May, and 14,500 for June; and recommendations for 75-100th percentile years were 4,000 cfs for April, 13,000 for May, and 16,,500 for June (Osmundson and Kaeding 1991). The mid-point of each flow window in Osmundson and Kaeding (1991) was regarded as the recommended. For 75-100th percentile flow years, a lower threshold was identified but no flow window was defined. Therefore, 100 cfs was added to April and May flow recommendations and 300 cfs was added to June

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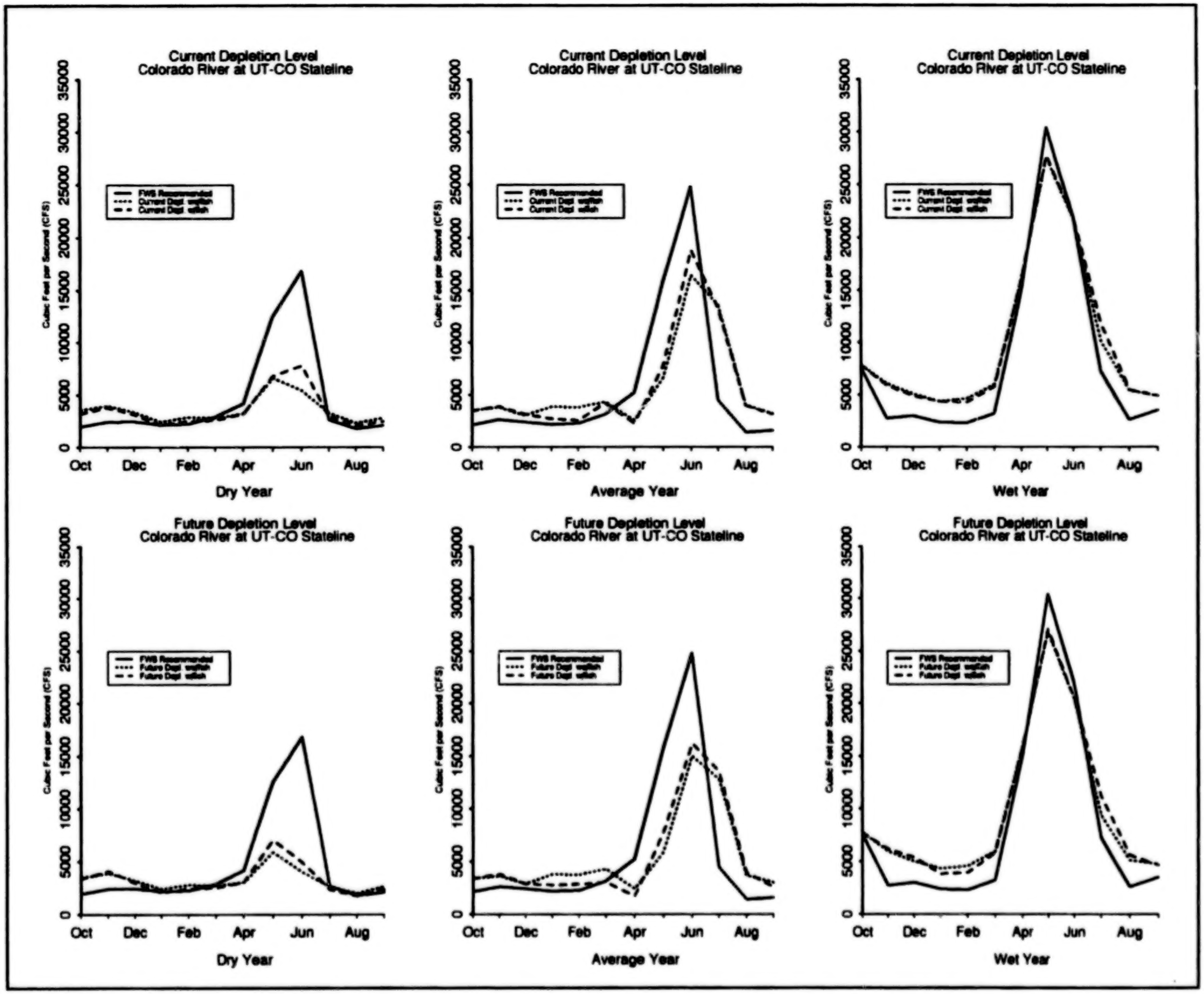

Figure II-6-8. Colorado River at Utah-Colorado State Line.

recommendations to meet the recommended criteria as well as to round off the lower threshold of the flow recommendation.

To achieve a relatively smooth hydrograph, flow recommendations for the 15-mile reach were stepped up (or down) in equal increments from the middle of each month. The week of each month that contained the median day for that month was assigned the recommended monthly flow, except for those months during which spring runoff began or ended (i.e., April and July), when the mean for the month would be expected to occur some distance up the ascending or descending limb of the hydrograph.

Recommendations for peak flows at the State Line gage were derived from Osmundson and Kaeding (1991). For 0-50th percentile years, 26,000 cfs is recommended as the peak mean daily flow; for 50-75th percentile years, 35,000 cfs is recommended; and for 75-100th percentile years, 50,000 cfs is recommended. All recommendations are mid-points except 50,000 cfs, which is halfway between 40,000 (considered to be beneficial) and 60,000 (the 1983 peak flow considered to be detrimental). Each peak flow recommendation was matched to the corresponding percentile of each given year (e.g., 1967 was a 0-50th percentile year and 26,000 cfs is recommended as a peak mean daily flow for such years). The date on which the peak mean daily flow is recommended was taken from Osmundson and Kaeding (1991). Flow recommendations were then stepped down on each side of the peak in equal increments to the nearest mean monthly flow recommendations.

8. Colorado River near Cisco

Flow recommendations for the Colorado River near Cisco (Figure II-6-9) were derived by adding the 1967-1985 Dolores River measured flows to the flow recommendations for the Colorado River near the State Line. No formal flow recommendations have been developed for conservation of endangered fishes in the Dolores River. The Dolores hydrograph has been altered significantly, but the effect that has had on

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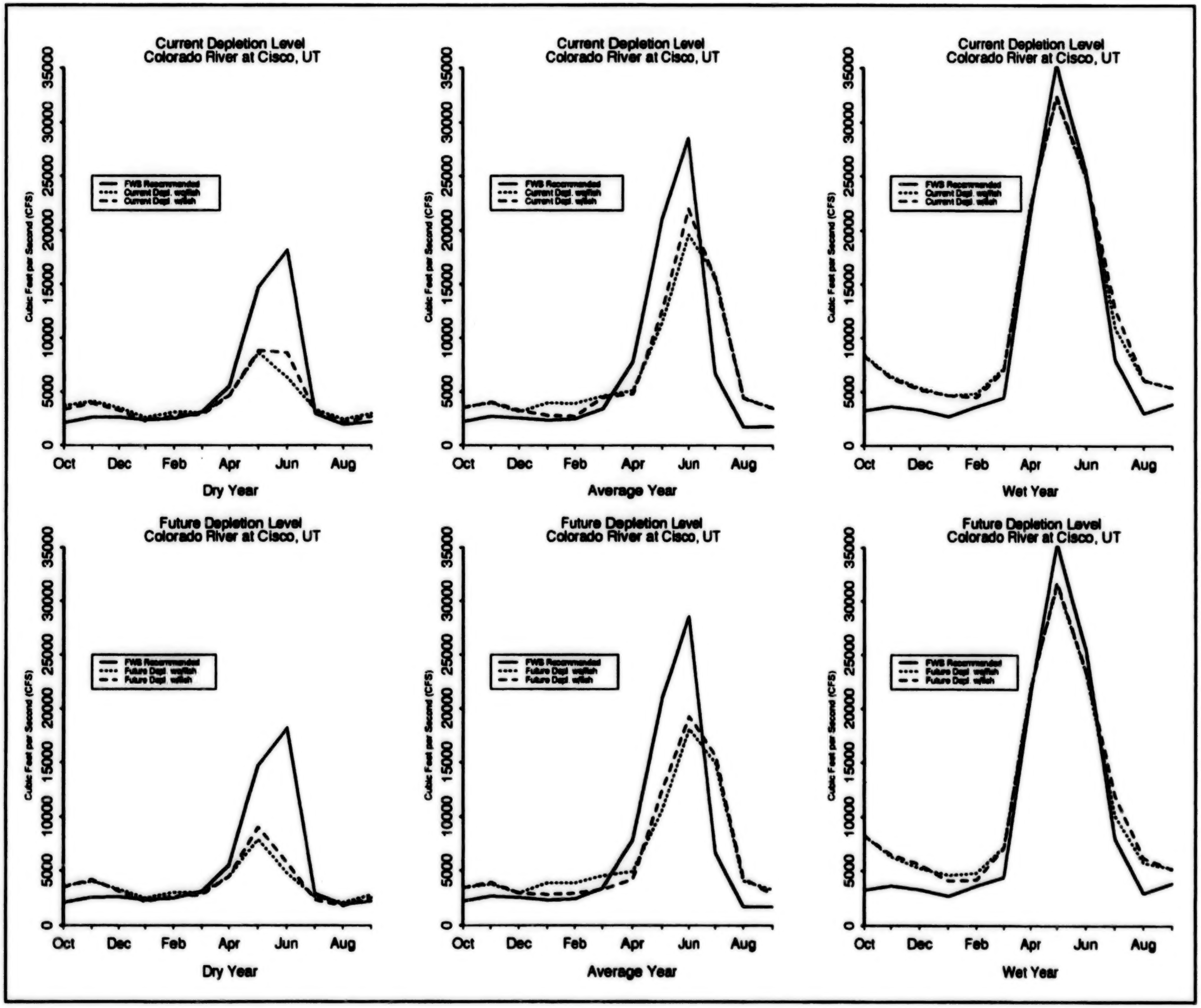

Figure II-6-9. Colorado River at Cisco, Utah.

endangered fishes and their habitats in the Dolores or in the Colorado River downstream from the Dolores, or on the recoverability of the endangered fishes in those sections of river is unknown. No biological justification was found for recommending greater or lesser flows. Future studies may yield information on flow requirements.

9. San Juan River at Shiprock

Preliminary flow recommendations were developed by the San Juan River Research Team (Figure II-6-10) (Team; Jim Brooks pers. comm.). The Team determined that flows which resulted in a naturally shaped hydrograph for the squawfish and overbank flooding at least one in five years for the razorback sucker would be best for use in the economic analysis. Based on a preliminary estimate of channel capacity by the Army Corps of Engineers, and on observations of the river channel, it was estimated that a flow of 11,000 to 12,000 cfs would be required for overbank flooding below Farmington (River Mile 198). The Team believes that releases from Navajo of 4,500 cfs, synchronized with peak flows of the Animas River, will result in flows greater than 11,000 cfs below the confluence with the Animas River about 30 percent of the time, and flows greater than 12,000 cfs about 20 percent of the time. To achieve a naturally shaped hydrograph, the Team recommended Navajo releases of 500 cfs during the winter (October 1 through approximately March 1), increasing uniformly from 500 cfs to 4,500 cfs on approximately May 25, held at 4,500 cfs for the week corresponding to peak flows of the Animas River, decreasing uniformly to 600 cfs by approximately July 10, and held at 600 cfs (or a level required to meet downstream demands if greater than 600 cfs) through the irrigation season (approximately July 11 through September 30). The Team emphasized that these recommendations are best estimates at this time, and that recommendations are subject to change based on results of ongoing research.

To translate the recommended flow releases from Navajo into flow recommendations for Shiprock, New Mexico (River Mile 166), researchers subtracted measured Navajo releases for the 1967 to 1985 time period from the flows measured at the Shiprock USGS gage station. The recommended Navajo releases were then added to the flow difference remaining at Shiprock. Based on perusal of the resultant weekly flow recommendations, it appears that

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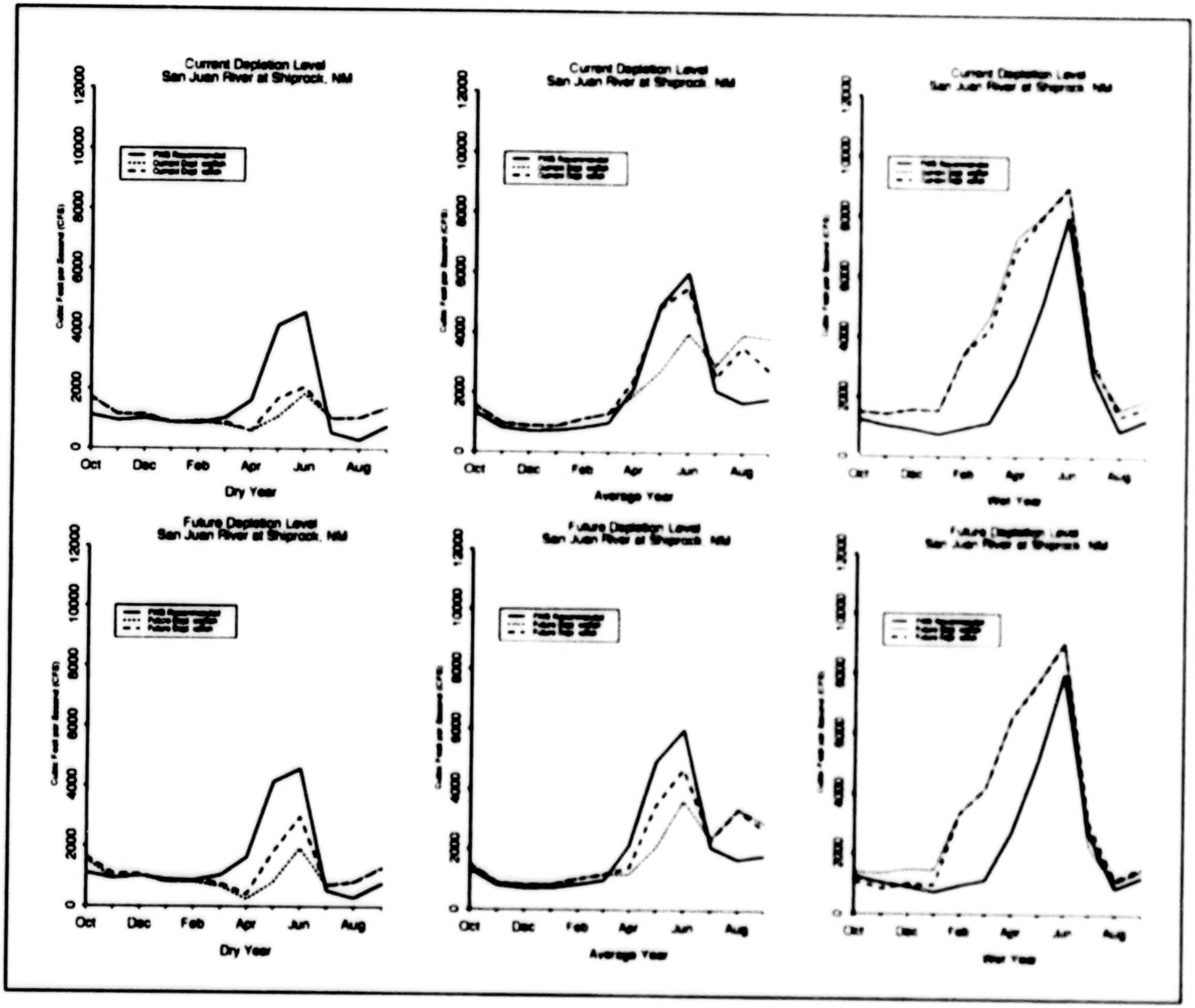

Figure II-6-10. San Juan River at Shiprock, New Mexico.

the 11,000 cfs recommended for below Farmington by the researchers is achieved three times (16 percent) during the 19-year period, and the 12,000 cfs recommendation is achieved once (5 percent).

10. San Juan River near Bluff

Flow recommendations for Bluff (Figure II-6-11) (River Mile 90), Utah, were translated from recommendations made by the San Juan River Research Team for releases from Navajo in the same way as they were for Shiprock, New Mexico. It appears that the 11,000 cfs recommended for below Farmington by the researchers is achieved three times (16 percent) during the 19-year period, and the 12,000 cfs recommendation is achieved once (5 percent).

11. Colorado River at Glen Canyon Dam

USFWS flow recommendations for the endangered fishes were developed for Lee's Ferry, Arizona, located 15 miles below Glen Canyon Dam. The Seasonally Adjusted Steady Flow Alternative mimics the natural hydrograph (Bureau of Reclamation 1993). Recommendations were developed assuming a minimum objective annual release from Lake Powell of 8.23 million acre-feet, as set forth in the Operating Criteria by the Bureau of Reclamation. Virgin flows average 11 to 15 million acre-feet per year at Lee's Ferry, and as much as 21 million acre-feet per year during high flow years. Therefore, recommendations are for what would have historically been considered as low-flow years. Upper Basin States are entitled to consumptively use 7.5 million acre-feet per year under the Colorado River Compact of 1922, so flows in the Lower Basin will likely never be as high as they were historically. However, during years when Glen Canyon releases exceed the minimum objective annual release, water in excess of 8.23 million acre-feet is recommended to be released during the spring flow months of April through June in such a manner as to fit within the 8.23 to 13.0 million acre foot flow window. Excess flows should be distributed to mimic the natural pre-dam hydrograph. For all years, a 30,000 cfs 10-day spike is recommended during May or June. Flow rates should be gradually increased or decreased from the recommended flow rates of one month to the recommended flow rates of the next month; ramping rates should not

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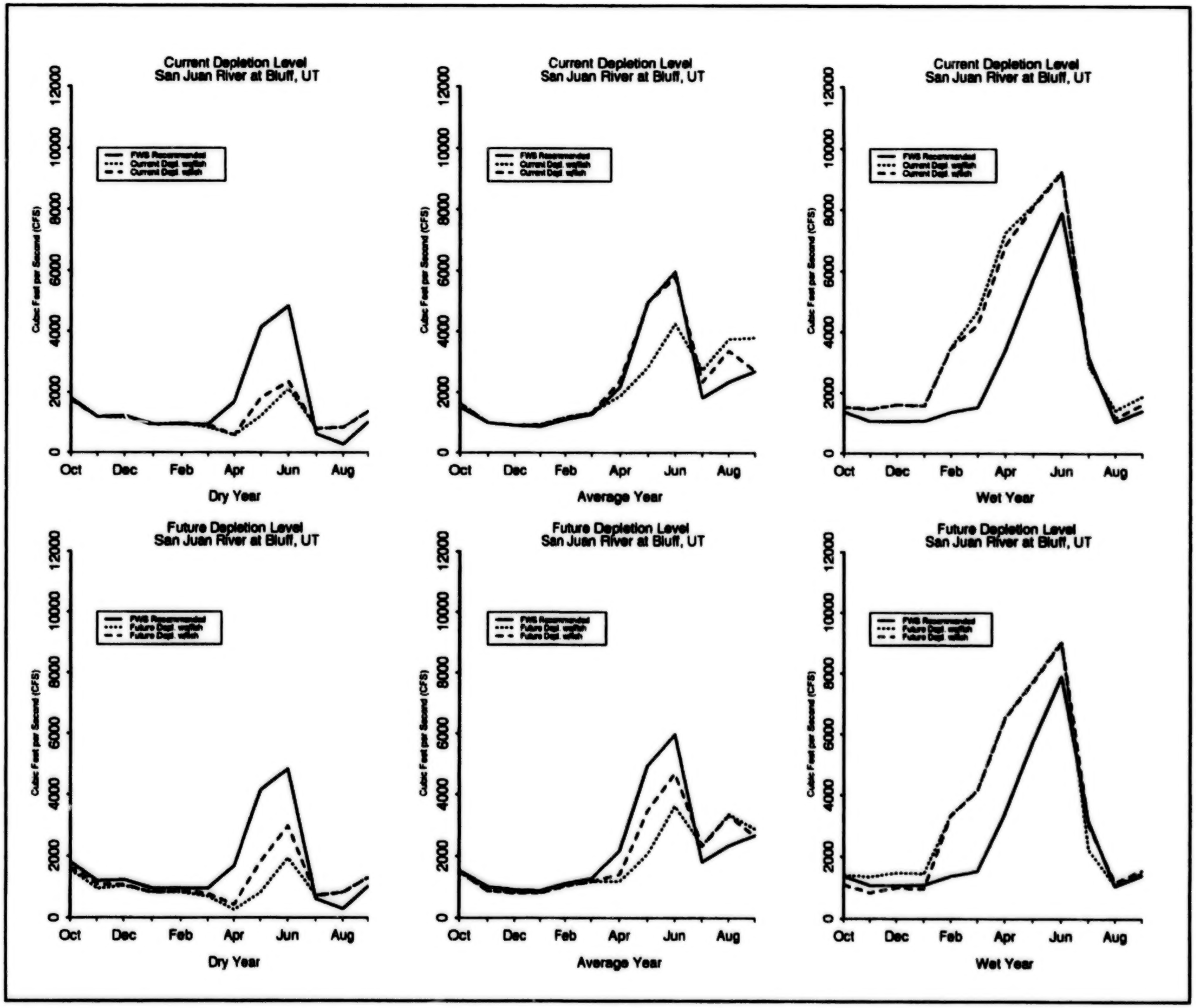

Figure II-6-11. San Juan River at Bluff, Utah.

exceed 2,000 cfs per day between months. Flows should be steady; daily fluctuations should not exceed plus or minus 1,000 cfs from mean daily flow for any given day.

The economic impacts of these flow recommendations may be quantified by comparing them to the Bureau of Reclamation's preferred alternative for operating Glen Canyon Dam. The Low Fluctuating Flow Alternative recommended by the Bureau of Reclamation results in a relatively flat hydrograph, except for a 30,000 cfs spike that occurs for a one-to-two week period during March. Year-round minimum releases are 8,000 cfs between 7:00 a.m. and 7:00 p.m.; 5,000 cfs at night. Higher daily (and nightly) minimum flows would be allowable during "high volume release months." The maximum release would be 20,000 cfs, except during wet years when it would be necessary to release additional water, and when releasing the annual 30,000 cfs spike. Daily flow fluctuations between 5,000 and 8,000 cfs would be allowed. Ramping rates of up to 2,500 cfs per hour would be allowed for increasing flows; ramping rates for declining flows would not exceed 1,500 cfs per hour.

12. Lake Mohave

An estimated 60,000 razorback sucker adults reside in Lake Mohave (Tom Burke pers. comm.). Spawning occurs primarily during February through April on inundated gravel terraces at depths ranging from two to seven feet. A Lake Mohave surface elevation of 638 feet above mean sea level has been found sufficient to inundate many of the terraced areas used by spawning razorbacks. Embryos generally require four to ten days to incubate, depending on water temperatures. During the egg incubation period, it is important that the razorback "nests" do not become dewatered by lowering reservoir levels. Therefore, it is recommended that the lake elevation become approximately 638 feet by February 1, and that lake levels do not drop more than two to three feet (the minimum depth used by razorbacks for spawning) during any consecutive 10-day period between February 1 and April 30. In other words, releases from Davis Dam may need to be replaced, to some extent, by releases from Hoover Dam. Lake Mohave levels may be raised by any amount (the reservoir becomes full at an elevation of 645 feet), but not lowered by more than two feet during any 10-day period. Because the management scenario that currently exists calls for filling the reservoir between January and April, and this would not change, economic impacts of managing Lake Mohave for razorback sucker egg incubation as described are expected to be minimal.

Volume II

Chapter 7: Input-Output and Computable General Equilibrium Modeling Framework

A. Input-Output Models

This section presents a summary of the essential features and underlying methodological assumptions of the input-output analysis undertaken to estimate the impacts due to critical habitat associated with the four fishes.[9] The analyses undertaken and the data employed are described in detail, along with a discussion of the detailed results of the input-output analysis that were used to generate the results reported in the body of the report.

Although subject to a fairly stringent set of underlying assumptions, the input-output method enjoys considerable support for its continued use in regional economic analysis. As Dervis, De Melo, and Robinson (1982) have noted,

> The core around which all such applied models are built is the input-output model pioneered by Leontief. The essence of input-output analysis is that it captures the crucial element of the interrelatedness of production arising through the flow of intermediate goods among sectors. Even with its assumptions of linearity and cost-determined prices independent of demand, the simple input-output model nonetheless represents a powerful tool for applied general equilibrium analysis.

The set of input-output models described herein is part of a staged investigation wherein each stage is intended to address particular issues. The initial stage is a separate model for each of the States in the affected region: California, Arizona, New Mexico, Nevada, Utah, Colorado, and Wyoming. This permits focus on the impacts that are generated by the proposed critical habitat designation within each individual State. In most cases impacts in a given State generate responses in neighboring States, and it is necessary to investigate the potential offsetting impacts in the larger regions. For this reason a second stage was undertaken in which a model was constructed of the entire region (all seven States included). The details of the spatial and sectoral aggregations are discussed below.

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[9] There are several textbook presentations of input-output analysis to which the reader may be directed. We suggest Miller and Blair [1985], H.W. Richardson [1972], and W.H. Miernyk [1965]. The notation used in this appendix follows that used by Miller and Blair.

B. The Input-Output Method

Input-output models are a device for organizing the basic accounting relations that describe the production sector of the economy.[10] The input-output method starts with a very simple idea: all sectors of the economy are tied together by virtue of economic relations called "linkages," and the production of a good or service can be described by a "recipe" with the ingredients being the outputs of the other sectors of the economy as well as the primary inputs such as labor, capital, and other raw resources. A simple example will serve to demonstrate. Consider a commodity such as steel. A particular economy with a given technology will allocate the steel it produces in a unique way. Some of the steel will be used to make equipment for making more steel (e.g., rolling mill equipment), some will be exported (or some will be imported), and some will be used in the manufacture of cars, buildings, bridges, etc. Obviously, all of the steel that is allocated or used up must add up to all of the steel that is made. If the total amount of steel made is 1,000,000 tons an allocation might be as follows:

Steel used to make steel	100,000 tons
Steel used to make cars	500,000 tons
Steel used to make bridges	100,000 tons
Steel used to make buildings	290,000 tons
Steel sold to households	10,000 tons
TOTAL steel production/allocation	**1,000,000 tons**

The steel used to produce other commodities in the economy reflect the "linkages" mentioned above. The extent to which the economy is an integrated whole depends on the strength of these linkages. Linkages that tie steel to the output of more finished products are known as forward linkages while those (not shown in this example) that relate steel to basic raw materials and labor are known as backward linkages.[11] A similar table could be constructed for every commodity in the economy, and taken together these would describe the entire economy. A common unit of measurement is necessary if the sectors are to be linked into a single model of the economy. Thus, all inputs and outputs are measured in dollar units rather than in physical units. To make use of all of these tables for the various commodities in the economy requires an analytical device that relates all of the backward and forward linkages in the economy in a manner which permits investigation of "what if" scenarios. This analytical device is the input-output table.

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[10] Although the input-output method was originally presented by Francois Quesnay in his *Tableau Economique* [1758] it owes its modern origins to the work of Wassily Leontief .

A schematic representation of an input-output model is represented in Figure II-7-1. This figure shows the economy organized into several key blocks for presentation. The X_{ij}'s denote the elements of the inter-industry matrix that is the heart of the input-output model. The row sums of the X matrix denote the intermediate demands for the outputs of each sector — thus, the row sum for sector 1 denotes the output of this sector that is required as inputs to sector 1 and the other sectors. The column sums denote the payments for intermediate goods used in the production of the output of sector 1. In addition to the intermediate demand there are several categories of final demand illustrated in the figure. Household consumption, investment, and government expenditures are all final demands in that they use the output of a sector directly and not as an input to another product. In addition to the payments for intermediate inputs there are several categories of primary inputs such as payments for labor and other value added components. Finally, exports (E_i) and imports (M_i) appear in the model.

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[11] These linkages depict the extent to which transactions remain within the economy being studied. To the extent the purchases by sectors (and the sales to sectors) "reach outside" the economy to other regions, the linkages will be less well developed.

	Purchasing Sectors		Household Consumption	Final Demand	Gross Output
Producing Sectors	1	2			
1	150	500	50	300	1000
2	200	100	400	1300	2000
Labor	300	500	50	150	1000
Value Added	350	500	500	400	2150
Total Payments	1000	1400	1000	2150	6150

Figure II-7-1. Simplified Numerical Example of an Input-Output Model

Total gross output is the sum of intermediate demand, final demand, and exports. Total gross outlay is the sum of payments for intermediate inputs, labor, other value added components, and imports. The notation of an input-output model may be expressed as follows:

The inter-industry matrix (z) is defined as:

$$z = \begin{bmatrix} 150 & 500 \\ 200 & 100 \end{bmatrix}$$

The vector of gross output (q) is defined as:

$$q = \begin{bmatrix} 1000 \\ 2000 \end{bmatrix}$$

The final demand vector (y) is defined as:

$$y = \begin{bmatrix} 300 \\ 1300 \end{bmatrix}$$

As noted, input-output models are a description of the inter-industry flows in the economy. A table is created (refer to Figure II-7-1) that is based on the fundamental accounting relationships linking intermediate and final demands to gross outputs. These yield the following system of equations:

$$\begin{aligned} X_1 - a_{11}X_1 - a_{12}X_2 - \ldots - a_{1n}X_n &= Y_1 \\ X_2 - a_{21}X_1 - a_{22}X_2 - \ldots - a_{2n}X_n &= Y_2 \\ &\ \,. \\ &\ \,. \\ &\ \,. \\ X_n - a_{n1}X_1 - a_{n2}X_2 - \ldots - a_{nn}X_n &= Y_n \end{aligned}$$

which may be rearranged to yield:

$$(1-a_{11})X_1 - a_{12}X_2 - \ldots\ldots - a_{1n}X_n = Y_1$$

$$- a_{21}X_2 + (1-a_{22})X_2 - \ldots\ldots - a_{2n}X_n = Y_2$$

$$\cdot$$

$$\cdot$$

$$\cdot$$

$$- a_{n1}X_1 - \ldots\ldots\ldots\ldots + (1-a_{nn})X_n = Y_n$$

where: X_i denotes output of sector i

Y_i denotes final demand for output of sector i

and a_{ij} denotes the amount of i used in producing one dollar's worth of j.

The crucial assumption for these equations to hold is that the money value of goods and services delivered by an industry i to other producing sectors is a linear and homogenous function of the output level of the purchasing sectors. The specific assumptions are: the linear output function means constant returns to scale and no substitution between inputs; additivity, the total effect of production is the sum of the separate effects (this rules out any external economies or diseconomies); the system is in equilibrium at given prices.[12]

In matrix notation the above system of equations can be represented as:

$$(I-A)X = Y$$

---

[12] Under some moderately restrictive assumptions it is possible to express the structure of the economy through the inter-industry flows which relate the amount of the output of a sector that is used to produce the output of another sector. The key assumptions have to do with the nature of the production functions and the way that industries producing multiple products are modeled. Input-output models assume that production can be characterized by what is known as a Leontief production function. If the only inputs are labor and capital, the Leontief production function is written as:

$$X = \min\{K/a, L/b\}$$

where X denotes the output of the industry, K is capital, L is labor and the coefficients a and b denote the exact production relation. This production function rules out substitutions among the inputs if relative prices of these inputs change. Price changes of inputs occur when there are changes in supply that are not offset by changes in demand and vice versa. If the prices changes are small this aspect of the Leontief production function will not lead to significant biases in the estimation of the overall impacts. However, if the price changes are large, the input-output analysis will tend to overestimate the economic impacts of exogenous shocks to the economy.

and the outputs necessary to satisfy intermediate and final demand may be solved for as:

$$\mathbf{X} = (\mathbf{I}\text{-}\mathbf{A})^{-1}\mathbf{Y} \text{ where } (\mathbf{I}\text{-}\mathbf{A})^{-1} \text{ is known as the Leontief inverse.}$$

To conduct economic impact analyses, this relation can be used to solve for the changes in gross outputs that must be generated to satisfy changes in final demands due to exogenous shocks to a local economy. Input-output models constructed in this manner are known as "demand side" models because all impacts are applied through changes in the final demand from the without fish scenario data.

It is useful to be able to distinguish A and $(\mathbf{I}\text{-}\mathbf{A})^{-1}$ conveniently in the discussions to follow, and so the elements of the A matrix will be denoted by a_{ij} and those of the Leontief inverse as α_{ij}. The A matrix is derived from the interindustry flow matrix z of Figure II-7-1 in the following manner:

$$A = z * \hat{q}^{-1}.$$

Through its multiplier impact analysis, the input-output model is capable of generating estimates of the changes in output of given commodities, changes in employment, and changes in income if one accepts the technical assumptions noted above. How critical are these assumptions to the task? To the extent the initial impacts on productive activities are small, the input-output model works quite well in providing estimates of listing and proposed critical habitat impacts.

In addition to the inter-industry effects captured in the Leontief inverse, special input coefficients can be generated for items of interest such as labor, water, and electric power. The general methodology is as follows, with employment (labor) serving as an example. Construct a vector of the inputs per unit of gross output:

$$E = [e_1, e_2, \dots , e_n]$$

where e_i denotes the employment (labor input) in persons per unit of dollar output for sector i. From this, construct a vector of total employment:

$$\mathscr{E}=\hat{E}X \quad where \quad \hat{E} = \begin{bmatrix} e_1 & 0 \\ 0 & e_2 \end{bmatrix}. \text{ Thus } \mathscr{E} = \begin{bmatrix} e_1X_1 \\ e_2X_2 \end{bmatrix},$$

and this final vector is the level of employment in each sector associated with the output levels X_1 and X_2. A change in these output levels, due to a change in final demand, results in a change in the level of employment based on the coefficients e_1 and e_2.

1. Multipliers

Economic impacts are generated by direct shocks to the economy, and these result in indirect effects through the economic linkages in the economy. There are a further set of economic effects which are generated through household income changes that occur as a result of the initial impact, and that lead to changes in consumption and thus to further changes in final demand. These are known as the induced effects of the original impact. There is not much debate concerning the validity of estimating the direct and indirect effects. However, there are differences of opinion concerning what types of effects can be captured under the induced label. Multipliers describe the effects of direct shocks on the economy. There are several types of multipliers that may be computed depending on the economic measure sought (output, income, or employment). The computational steps to derive the basic multipliers are described below.

a. Output Multiplier

For a given sector, the output multiplier is defined as the total value of production in all sectors of the economy that is necessary to satisfy one dollar's worth of final demand for the given sector's output. Simple output multipliers capture the direct and indirect effects of the exogenous shock and are computed by taking the column sum of the respective rows of the Leontief inverse matrix. In matrix notation, the simple output multiplier is the row vector **O** = $[O_1, \ldots, O_n]$ where:

$$\mathbf{O} = \mathbf{i}'(\mathbf{I}-\mathbf{A})^{-1}$$

and where **i'** denotes the unity row. These are the output multipliers that are reported for the various regions below.

b. Income Multipliers

These translate the impacts of final demand spending changes into changes in income received by households. These multipliers translate an initial dollar of output for a sector into a direct plus indirect estimate of the value of resulting employment and, in turn, household income. Income multipliers can be computed as "simple income multipliers" or as the Type I and II multipliers often reported in impact studies.

Simple income multipliers are represented by the vector **H** = $[H_1, \ldots, H_n]$, and are calculated as:

$$\mathbf{H} = \mathbf{H}_R(\mathbf{I} - \mathbf{A})^{-1}.$$

Where $\mathbf{H}_R$ denotes the household row coefficients which represent the earnings and salaries paid to the labor input to the production in each sector.

Income multipliers may be referred to as Type I or Type II. The former capture the direct and indirect effects on the incomes of households, while the latter add the induced effects that arise from the employment consequences of the output changes. These employment effects generate household income effects which augment the direct and indirect effects.

Type I multipliers are computed as:

$$\mathbf{M} = \mathbf{H_R}(\mathbf{I} - \mathbf{A})^{-1}(\mathbf{H_R})^{-1}.$$

The usual Type II multipliers capture the direct and indirect effects of the Type I multipliers as well as the induced effects attributable to consumption effects on final demand. These consumption effects work through the total final demand to increase the level of gross output required to meet the sum of intermediate and final demand. Bradley and Gander (1969) prove that the ratio of Type II to Type I multipliers is a constant for each sector of the economy. This constant is defined as:

$$1/b \text{ where } b = [(1-h)-\mathbf{H_R}(\mathbf{I}-\mathbf{A})^{-1}\mathbf{H_C}]$$

where h denotes intersection of the household row and column as shown in Figure II-7-1; $\mathbf{H_R}$ is the household row and $\mathbf{H_C}$ is the household (consumption) column in the input-output table in the **A** matrix. Thus, the Type II income multiplier for a given sector i is computed as the Type I multiplier divided by b.

c. Employment Multipliers

The employment multipliers describe the employment impacts, in each sector, associated with a change in final demand for goods produced within the regional economy. Simple employment multipliers compute the direct and indirect effects of an economic impact, while the total multipliers capture the induced effects as well. With $\mathbf{W_R}$ representing the vector of the ratio of earnings to output in each sector, the simple employment multipliers for each sector are the vector **E** where:

$$\mathbf{E} = \mathbf{W_R}(\mathbf{I} - \mathbf{A})^{-1}$$

The Type I employment multipliers are the vector **J**:

$$\mathbf{J} = \mathbf{E}(\mathbf{W}_R)^{-1}$$

As with income multipliers there is a constant ratio of Type II to Type I multipliers. This ratio is:

$$d = (1/b)\mathbf{W}_R[(\mathbf{I} - \mathbf{A})^{-1}\ \mathbf{H}_C\ \mathbf{H}_R\ (\mathbf{I} - \mathbf{A})^{-1}]$$

where b is defined as above.

2. External Trade in Input-Output Models

Imports fall into two classes: competing and non-competing. Competing imports consist of goods and services that are imported into a region for which there is production within the region. Non-competing imports consist of goods that have no regional production. For the Colorado River Basin input-output model, the competing imports substantially outweigh the non-competing imports. This is to be expected for a small open economy (SOE), which is how one would describe a region within a large national economy such as that in the United States.

The SOE assumption of the open Leontief input-output model assumes exports are exogenously determined by the level of economic activity in the rest of the world. A shock to the economy of a region will have the effect of changing the regional demand for the exports of other economies, which would then also affect the demand for the region's exports. However, if the region is assumed to be a small enough part of the world economy, the effects are negligible. Thus, assuming that export demand is exogenous is not extreme.

The demand for competing imports can be specified as:

$$\mathbf{IM} = \hat{\mu}\mathbf{X}$$

where $\hat{\mu}$ is a diagonal matrix whose elements represent coefficients that reflect import propensities; $\alpha_i = IM_i/X_i$. If total supply is defined as $Q = X + IM$, then

$$Q=X+\hat{\mu}X=(I+\hat{\mu})X$$

and

$$X=(I+\hat{\mu})^{-1}Q$$

Total demand for regional output is the sum of demand within the region and export ("foreign") demand. Since exports are assumed to be exogenously determined, total demand is $Y = DD + FD$ where DD denotes domestic demand and FD foreign demand. Defining $A^* = A(I + \hat{\mu})^{-1}$, the $Q = (I - A^*)^{-1}$ $(DD + FD)$ is the equivalent of $X = (I-A)^{-1}Y$ if external trade is not included in X or Y. In general, the effect of introducing external trade is to reduce the impacts of exogenous shocks since some of the effects escape the regional economy in the form of leakages.

C. Empirical Procedures Used To Construct and Apply the Input-Output Models

The steps followed in the construction of the input-output models at the various stages are summarized in the flow chart presented in Figure II-7-2. These steps are discussed in the following paragraphs.

The Impact Analysis for Planning (IMPLAN) data bases were used to develop a complete model for 1982 and to provide the means for conducting aggregation of the original 528 sectors to the 20 that were used in the I-O model stages.[13] There are several advantages to lake levels do not drop more than two to three feet (the minimum depth used by razorbacks for spawning) during any consecutive 10-day period between February 1 and April 30. In other words, releases from Davis Dam may need to be replaced, to some extent, by releases from Hoover Dam. Lake Mohave levels may be raised by any amount (the reservoir becomes full at an elevation of 645 feet), but not lowered by more than two feet during any 10-day period. Because the management scenario that currently exists calls for filling the

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[13] An alternative data source for the I-O tables would be the BEA I-O tables for 1982. These tables are only available at the national level and would require regional data to generate regional tables by, say, a RAS procedure. The IMPLAN procedure was selected because it was developed primarily to construct regional level I-O models.

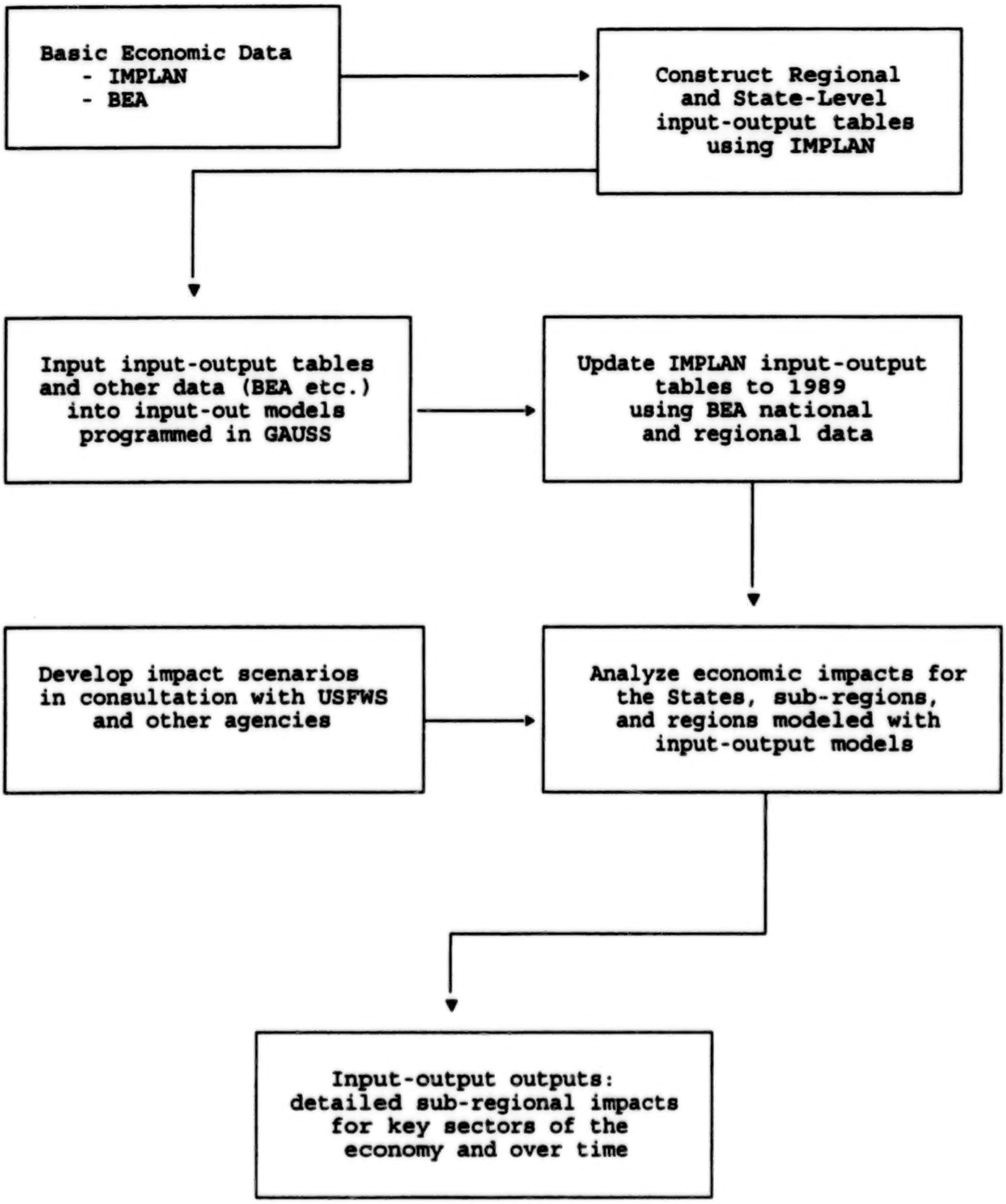
Basic Economic Data
- IMPLAN
- BEA
Construct Regional and State-Level input-output tables using IMPLAN
Input input-output tables and other data (BEA etc.) into input-out models programmed in GAUSS
Update IMPLAN input-output tables to 1989 using BEA national and regional data
Develop impact scenarios in consultation with USFWS and other agencies
Analyze economic impacts for the States, sub-regions, and regions modeled with input-output models
Input-output outputs: detailed sub-regional impacts for key sectors of the economy and over time

Figure II-7-2. Input-Output Modeling Flow Chart

the use of IMPLAN for this purpose. In particular, the IMPLAN data bases permit construction of regional and State inter-industry matrices. IMPLAN data files contain the data required to construct social account matrices (SAM's) for the study regions. IMPLAN also provides a convenient mechanism to aggregate the original 528 sectors in the data base to more manageable numbers. The sectors in the final models are presented in Table II-7-1. Chapter II-8 provides a detailed discussion of the aggregation scheme that was used. IMPLAN data sets for the relevant regions comprise:

a. The inter-industry flow matrix (the **z** matrix)

b. The value-added components covering employee compensation, capital earnings, taxes, and imports

c. The final demand components covering consumption, investment, government expenditure, and exports

d. Employment by sector

e. Gross outputs by sector

f. Total factor payments by sector

g. Imports and exports by sector.

IMPLAN constructs the input-output table using the commodity-by-industry structure which allows it to deal with issues such as multi-product industries. Thus, the **A** matrix is created from the following manner for the commodity by industry table:

$$a_{ij} = z_{ij}/x_j.$$

This denotes the dollar requirement of industry i's output that is required to produce a dollars worth of industry j's output. To update the model to 1989, the Gross State Product data from the Department of Commerce, Bureau of Economic Analysis (BEA) were used to update final demand levels for each of the 20 sectors of the input-output model. These data are available at a State level for the period from 1982 through 1989 for 73 sectors that can be matched (via Standard Industrial Code "SIC" codes) to the 20 sectors represented in the input-output models constructed for this project. In this way, the economic activity reported in the 1982 IMPLAN data set was updated to 1989 (in 1982$). The updated gross output levels were used to update the remaining components of the input-output models based on the 1982 ratios and coefficients.

The IMPLAN-generated data files formed the basis of the initial data used to construct the input-output models. These files were manipulated initially in Lotus 123 to generate output that could be used in the input-output model that was programmed in the GAUSS programming language. That is, the use of IMPLAN for the I-O modeling was confined to the construction of the input data sets to the I-O models that were developed in the GAUSS programming language.[14] IMPLAN was not used to develop the actual I-O modeling framework primarily due to the difficulties associated with using IMPLAN to generate the projections through the year 2020 that formed the without fish scenario that was used in the analysis reported in subsequent chapters.

BEA State-level projections to 2020 were used to update the model over time. This allowed the development of a realistic time path for the without fish projections that form the basis for evaluation of the impacts resulting from listing and proposed critical habitat effects. The BEA projections provided data on employment by sector by State for the years 1995, 2000, 2005, 2010, and 2020 (the projection for 2015 was obtained by linear interpolation). These data were used to project the gross output by sector on the basis of the 1982 coefficients and ratios.

For example, the employment/output ratios for each sector calculated from the 1989 year model were used to derive the output levels for 1995, 2000, and so on by multiplying these ratios and the employment projections generated by the BEA. These projections relate the employment projections by sector, by State. In the agricultural sectors (1 through 4) this employment is projected to decline over the next 20 years. Output is expected to rise slightly in these sectors, thus the decline in employment is due to various technological changes. The derived gross output figures were then used to generate the remaining data that would form the benchmark against which the impacts due the listing and proposed critical habitat effects on economic activity within the respective region were compared.

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[14] The use of the IMPLAN generated files is discussed in the Appendix to this chapter.

D. Application of the Models to Impact Analysis

The BEA regional projections data were used to construct the without fish scenario through 2020. This was used as a basis of comparison with the total impacts from adjustments for endangered species. The impacts were evaluated for each of the periods that the models were estimated for. That is, impacts were evaluated for 1995, 2000, 2005, 2010, 2015, and 2020. In each case, the economy was presumed to grow at the rate implied by the BEA regional projections. Thus, in each period, the comparison is between the level of activity that would have existed following the impacts of the previous period and the projected growth rates versus the levels of activity with the endangered species actions taken in that period. This provides a time path that is characterized by somewhat discrete changes as opposed to continuous changes. The resulting time path is, however, a fair representation of the impacts associated with endangered species actions.

The impact scenarios that were employed are discussed in Chapters II-9 and II-10. These scenarios were constructed with information that was collected from many sources and compiled to be consistent across the sectors of the regional economies. Particular attention was paid to those sectors that were expected to experience the greatest direct impacts as a result of the critical habitat designation. The direct impacts were projected to the year 2020 at intervals (initial impact, 1995, 2000, 2005, 2010, 2015, and 2020) in order to project the future economic effects of endangered species actions. All direct impacts were converted to final demand changes for input to the input-output models. This is a common approach when using demand-side input-output models (see Miller and Blair [1985]).

E. The Computable General Equilibrium (CGE) Model

The CGE model is constructed as in a textbook description of the economy. The household sector is represented as utility-maximizing consumers. The production sector is represented as profit-maximizing firms whose decisions determine the supply of goods and the demand for factors of production (primary and intermediate inputs). International (interregional) trade is represented. There is a government sector collecting taxes and providing collective goods and there are the market clearing conditions (may be based on assumptions concerning equilibrium or disequilibrium outcomes). The level of detail in each sector is determined by the policy application of the model and the availability of data.

A CGE model can be used to investigate several impacts such as changes in the levels of primary factors (labor and capital) to reflect the direct impacts of endangered species; changes in other inputs such as intermediate products (the outputs of the affected sectors — such as hydroelectric power — that are used as inputs in production that takes place in other sectors of the economy that have not been directly affected); and changes in the final demands for goods and services directly that give rise to feedback effects.

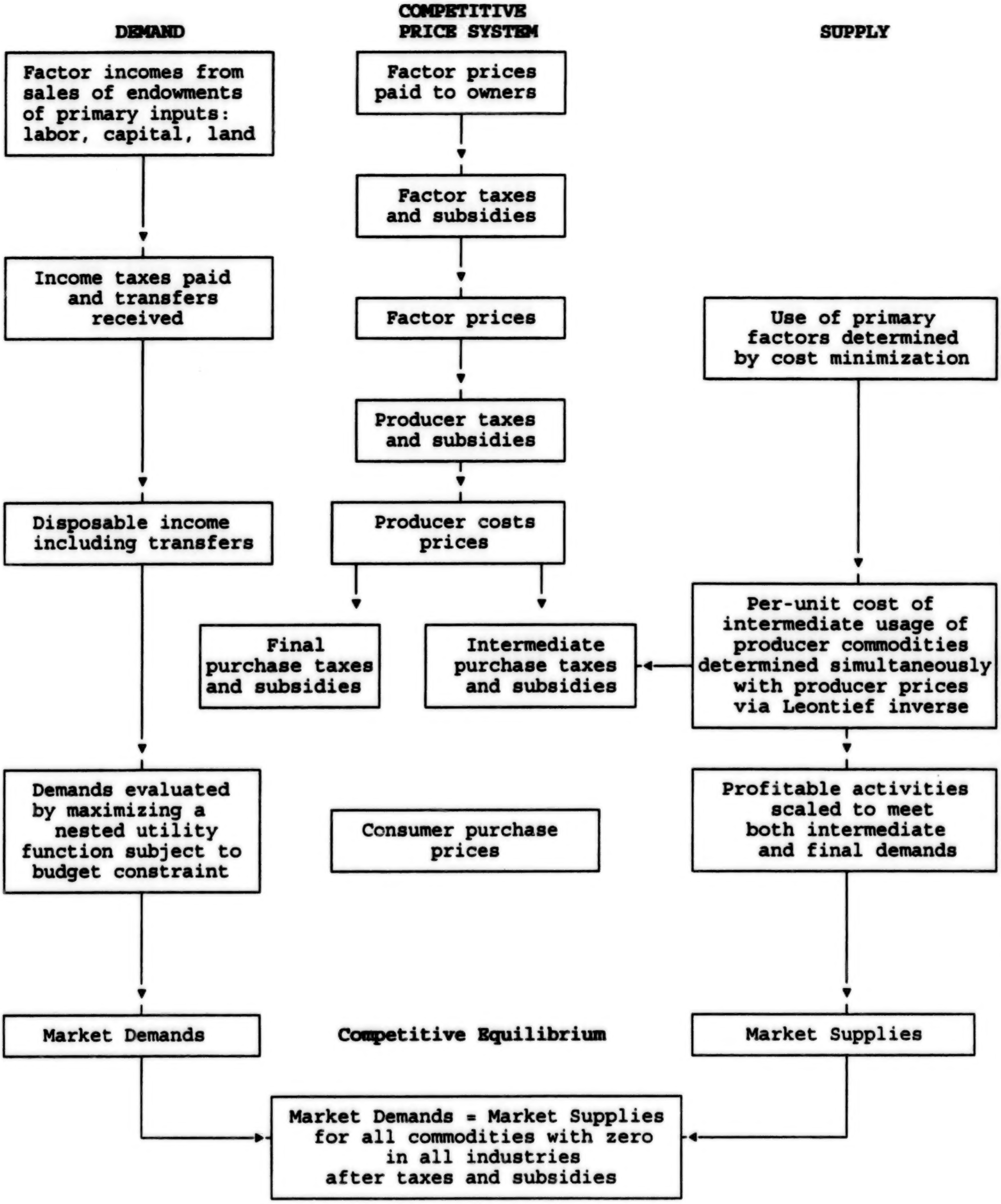
Berck, Robinson, and Goldman (BRG 1991) note that CGE models are particularly adept at analyzing the impacts of large-scale projects since they do not require assumptions that prices are fixed throughout the analysis. BRG employ a regional CGE model to investigate the impacts of the San Joaquin Valley irrigation projects. Shoven and Whalley (1984) survey the literature on the use of CGE modeling to investigate the effects of different taxation structures and different trade regimes. Dervis, De Melo, and Robinson (1982) survey the use of CGE models in economic development policy analysis. There are many potential applications of CGE models to investigate the impacts of large-scale exogenous impacts and various nonmarket effects (See Figure II-7-3).

CGE models are inherently static — they solve for economic equilibrium after the exogenous shocks have worked their way through the economy. The analysis that is conducted using a static CGE model is known as "comparative statics": the allocation of economic resources is compared before and after an exogenous shock.

CGE models offer several advantages over input-output models, but a central advantage is that CGE models admit factor substitution in production, in response to changes in relative prices, while the conventional input-output model employs a fixed proportion (Leontief) production function. The usual production function employed in CGE models consists of a nested form involving either Cobb-Douglass/Leontief or CES/Leontief forms. The intermediate inputs (outputs of the other sectors in the economy) enter the production function in fixed proportions with coefficients from a regional input-output table. The primary inputs (labor and capital along with land, energy, etc., if these are modeled) enter the top-level of the production function along with the composite input produced as intermediate goods.

The arguments in favor of the CGE approach to investigate the impacts of endangered species listing and proposed critical habitat designation are compelling. CGE models extend the Walrasian analysis of input-output models to include both multiple households and also substitution possibilities on the production side. Further, prices of final goods, intermediate inputs, and primary inputs are determined as part of the solution. Intrinsic to CGE models is the determination of the net economic changes that occur as a result of the exogenous changes being investigated.

Figure II-7-3. Flow Chart Depiction of a CGE Model


DEMAND
COMPETITIVE PRICE SYSTEM
SUPPLY
Factor incomes from sales of endowments of primary inputs: labor, capital, land
Factor prices paid to owners
Factor taxes and subsidies
Income taxes paid and transfers received
Factor prices
Use of primary factors determined by cost minimization
Producer taxes and subsidies
Disposable income including transfers
Producer costs prices
Final purchase taxes and subsidies
Intermediate purchase taxes and subsidies
Per-unit cost of intermediate usage of producer commodities determined simultaneously with producer prices via Leontief inverse
Demands evaluated by maximizing a nested utility function subject to budget constraint
Consumer purchase prices
Profitable activities scaled to meet both intermediate and final demands
Market Demands
Competitive Equilibrium
Market Supplies
Market Demands = Market Supplies for all commodities with zero in all industries after taxes and subsidies

Source: adapted from Piggot (1988)

The basic structure of a CGE model involves the following components:

1. A list and description of the economic agents, factors, produced goods, and the policies or impacts to be analyzed by the model;

2. The endowments of the consumers (individuals ultimately own all factors of production) must be numerically specified in terms of units of capital and labor (and, if necessary, other factors such as land), together with their transfer income entitlements (whether cash or in-kind);

3. Some form of functional representation must be chosen to describe the behavior of the economic agents (producers, consumers, government). These embody the behavioral assumptions concerning the agents. For example, it is commonly assumed that consumers maximize utility, and producers maximize profits (or minimize costs);

4. Parameter values must be provided for the functional representations noted in item 3. With the method employed in the seven-State regional model, these parameters are determined internally within the model on the basis of the without fish scenario data. Other methods require that these parameters be specified exogenously;

5. A complete description of the policy parameters must be provided (changes in basic resources, for example);

6. An equilibrium concept given by a set of (equilibrium) prices and quantities such that demands equal supplies for all goods and factors, tax collections equal disbursements (including debt retirement), and zero profits prevail in the production of all commodities.

F. The CGE Model Method

Robinson (1989) describes four basic methodological approaches that have been employed for the construction of a multisectoral CGE model. The first involves formulating the CGE model as a problem in finding a fixed point in a mapping of prices to prices. This requires construction of a full set of excess demand equations (one for each commodity in the model). In general, this approach employs some variation on the fixed point algorithms developed by

Herbert Scarf.[15] In most applications this method requires that the production and utility function parameters be specified exogenously (be derived from previous published studies). The second approach involves treating the CGE model as a set of non-linear algebraic equations and applying a numerical solution technique to obtain the equilibrium solution. This approach was developed by Adelman and Robinson (1978), and has been widely applied.[16] Since much of the developmental work was led by Sherman Robinson, the approach will be referred to as "Robinson method" hereafter. This is the method that will be used for this current project. The third approach begins by linearizing all the equations of the CGE model and then solving the linear system via a matrix inversion solution technique. This method was pioneered by Johansen (1960), and has been used in a number of applications. The resulting solution is an approximation of the economy within the neighborhood of the original equilibrium. This method is also quite tedious to apply to complex or highly detailed models. The fourth approach relies on a non-linear programming model in which the economy is constructed as a set of side-constraints, and an objective function (perhaps a social welfare function) is maximized subject to these technical constraints. This technique was widely used in the late 1960s and early 1970s.

As Robinson (1989) notes, "all of these techniques work," and it is up to the modeler to choose an appropriate method. This choice will be governed by theoretical considerations as well as data requirements and ease of interpretation of the results. As noted above, the model developed for this project utilizes the technique developed by Robinson (along with several of his colleagues). This approach has several advantages for regional applications. The USDA IMPLAN project provides a nearly complete data base that can be aggregated to a State or regional level. This data base includes the input-output accounts and the Social

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[15] The work of Shoven and Whalley follows this tradition.

[16] One such application is the study conducted by Berck, Robinson, and Goldman (1991) of the San Joaquin Valley in southern California.

Accounts Matrix (SAM).[17] This data base is augmented with data from the Census of Agriculture, which provide data on employment in agriculture sectors and land use, and the BEA Wealth Tapes, which provides data on capital stock by economic sector. Models constructed via the Robinson approach are typically solved using computer programs designed to solve large-scale systems of non-linear equations. The General Algebraic Modeling System (GAMS) software was adopted to solve the model of the seven-State region. This package offers considerable flexibility in the construction of the CGE model and in conducting simulation analyses.

1. The Social Accounts Matrix

The SAM provides a link between the National Income and Product Accounts (NIPA) data and the input-output accounts data. As such, it serves as a cornerstone of the CGE models constructed using the Robinson method. The specific structure of the SAM is determined by the application at hand.[18] However, the basic elements are common to all SAM's. A stylized SAM will be used to present these elements, and the SAM for the seven-State region will be presented.

A stylized SAM is presented in Table II-7-1, and this will be used to illustrate the basic elements of the construction of a SAM. The data within the SAM represent flows of receipts from the column entries to the row entries. The upper left section of the SAM shows the commodity by industry input-output accounts in which the flows between sectors are captured. The remainder of the SAM reports the transactions typically recorded as part of the NIPA data. That is, the flows from the Enterprises to the Households, Government, and Capital Account (investment) are recorded in the column headed "Enterprises." The remaining entries are self-explanatory (Table II-7-2).

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[17] The I-O accounts are discussed in the appendix relating to the various I-O models developed for this project. The SAM accounts are discussed below.

[18] As Robinson notes, "there is no such thing as a general SAM."

Table II-7-1. A Stylized SAM

	Activities								
	1	2	3	4	5	6	7	8	9
Receipts	Activities	Goods	Factors	Enterprises	Households	Government	Capital Account	World	Total
Activities		P * X						E	Total Sales
Goods	P * X(i)				C_H	C_G	I		Total Demand
Factors	W * F								Value Added
Enterprises			π			Tr			Enterprise Income
Households			$W_L * F_L$	D		Tr			Household Income
Government	$t_i * X$		$t_F(W * F)$	$t_e * \pi$	$t_H + Y_H$				Government Expend.
Capital Account				π - D - $(t_e * \pi)$	S_H	S_G		Capital Inflow	Total Savings
World		M							Imports
Total	Total Payments	Total Absorption	Value Added	Enterprise Expenditure	Household Expenditure	Government Expenditure	Total Invest.	Foreign Exchange	

Note: π denotes profits
D denotes depreciation
W denotes factors payments
F denotes primary factors
(capital, labor, land)
S denotes savings
M denotes imports
C denotes consumption

E denotes exports
Y denotes income
t denotes tax rates for respective sectors
X denotes output
I denotes inventories
P denotes prices
subscripts are used to denote agents: households, government
Tr denotes transfers

Table II-7-2. Definitions of terms used in SAM.	
EARNINGS:	payments to labor
ENTRPR:	enterprises
GOVT:	government (all levels)
HHIGH:	high income households
HLOW:	low income households
HMID:	middle income households
INDTAX:	indirect taxes on commodities
INDUSTRY:	industrial sectors
INVEST:	investment
LAND:	land used in agricultural production
PROFITS:	return to capital invested (other than agricultural land)
WORLD:	rest of U.S. and rest of world

Since the SAM records the circular flow of funds within the economy it must "balance." That is, for each element of the SAM, the row and column sums must be identical: Enterprise Income must match Enterprise Expenditure, and so on. If this condition is not met, there is a leakage or an injection that is not being captured, which implies the data underlying the SAM are not complete or that the model is not correctly specified. Obtaining a balanced SAM that reproduces the initial year data is the first step in verifying the internal consistency of the CGE model.

The SAM accounts provide the underlying data framework for the CGE model with an income-expenditure account for: Land (the agriculture sector), Industries (all producing sectors), Labor (represented as earnings), Capital (represented as profits), Enterprises, Households (separated into high, medium, and low incomes), Government, Investment (capital formation), Indirect Taxes, and World (rest of U.S. and the world). By organizing the SAM in this way, the effects on the key classes of economic agents in the economy can be investigated.

Discussion of the elements of the stylized SAM is facilitated by adopting the convention of identifying the cells by the row and column. Thus, (1,2) represents the element at row 1, column 2. Each element represents a transaction between the column entity and the row entity. Not all cells are filled because some transactions are not defined.

(1,2) represents the dollar volume of domestic sales since it reports the flow of funds from the sale of commodities to the industries located within the regional economy.

(2,1) represents the dollar volume of sales of intermediate goods that are used as inputs.

(2,5) represents household consumption of commodities.

(2,6) represents government purchases of commodities

(2,7) represents investment in commodities

(3,1) represents total payments to all factors of production where W is the vector of factor prices and F the vector of factor inputs.

(4,3) represents gross profits, which is the return to capital.

(5,3) represents earnings to households where W_L denotes earnings and F_L denotes the volume of labor.

(5,4) represents profits that are distributed to households in the form of dividends, interest on debt, or capital gains.

(6,1) represents total indirect taxes collected from the production of goods — t_i is the tax rate while X is the tax base.

(6,3) represents factor taxes collected by the government. Some examples of these taxes are social security taxes, personal income taxes, and taxes on the use of other inputs.

(6,4) represents taxes paid by enterprises.

(6,5) represents taxes paid by households to all levels of government

(7,4) represents retained earnings to be used for capital formation.

(7,5) represents household savings

(7,6) represents government savings

(8,2) represents the volume of imports to the region from the rest of the U.S. and the world.

The above stylized SAM shows that all of the market transactions within the economy are captured within this framework. The structure of the SAM used for the Basin regional model was determined on the basis of the structure of the economy that was being studied and on the economic sectors of interest. The Basin regional SAM is presented below when the CGE model is discussed.

2. The Mathematical Structure of a CGE Model

In this section the basic functional relationships for the categories of economic agents and the basic assumptions concerning economic behavior are described. The model is constructed under the assumptions that the economy is competitive. All prices are presumed to be able to adjust to clear factor and goods markets. All consumers maximize utility, and all producers maximize profits (or, equivalently, minimize costs). Production is characterized by constant returns to scale so that factor payments exhaust the value of the product. Supply (domestic production plus imports) equals demand (domestic consumption plus exports) in all markets.

a. Production Sector

The outputs of the 19 sectors of the economy are produced with inputs of labor, capital, land (where applicable), and an intermediate good. The intermediate good is a composite commodity with the weights determined by the input-output coefficients from the initial data set. The production function is defined as a constant returns Cobb-Douglas over the primary factors:

$$X_i^D = A_i L_i^{\alpha_{iL}} K_i^{\alpha_{iK}}$$

(this is the expression for the non-agriculture sectors) where $\alpha_{iL} + \alpha_{iK} = 1$ and A_i is a constant.

The primary factors account for the output net of that explained by the intermediate goods and the imports used in these intermediate goods. This residual is labelled the unit value added, and it is defined as:

$$P_i^{VA} = P_i - \sum_j P_j a_{ji} - t_i - M_i$$

where the second term represents the value of the intermediate input to good i, t_i the indirect taxes, and M_i the imports used to produce the good i. This unit value added is attributed to the labor and capital (also land) inputs from the region. Profit maximization requires that these factors be hired to the point that their price equals their marginal value added:

$$P_i^{VA}\left(\frac{\partial X_i^D}{\partial L_i}\right) = \alpha_{iL} w$$

The factor markets clear when this condition is met and when the sum of labor (capital, land) demanded equals the sum supplied.

b. Consumption Sector

There are three households in the economy: High Income, Middle Income, and Low Income.[19] Income is earned through the sale of factors of production. Each household devotes income to the goods produced by the 19 sectors of the economy and to savings.

Total consumption (C) for each household class is given by:

$$C = (1-s)Y$$

where s denotes the marginal propensity to save and Y the household disposable income. The consumption for each good is then the share of this total consumption devoted to each good:

$$C_i = (\omega_i C)/P_i$$

where ω_i denotes the share spent on good i and C is total consumption.

c. External Sector (World)

In classical trade theory, for a small open economy (SOE) there is an assumption concerning prices of traded goods that is sometimes referred to as "the law of one price." Traded goods are assumed to be perfect substitutes independent of geographic area of production, the implication being that prices are independent of region of production. Since regions are observed simultaneously importing and exporting the same "good", the law of one price is probably not an accurate reflection of price formation in the SOE. That is, domestic and imported goods are likely to be imperfect substitutes. This is particularly the case with the levels of aggregation that are commonly used in applied work. Armington (1969) postulated a weighted price formation mechanism in which the domestic price of a good was generated by a function that applied weights to the fraction of the regional consumption of the good that was domestically produced and the fraction that was imported into the region. This "Armington function" has been widely used in CGE modeling.

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[19] The baseline income levels are (1982$)

Domestic consumers are assumed to have a CES utility function over domestic produced and imported goods (for a given category of goods):

$$X_i = A_i^c[\delta_i M_i^{-\rho_i} + (1-\delta_i)XD_i^{-\rho_i}]^{-1/\rho_i}$$

where A_i^c and δ_i are constants estimated from the without fish scenario data and σ_i is the elasticity of substitution between domestic and imported goods and $\sigma_i = 1/(1+\rho_i)$. Consumers are assumed to choose a mix of domestic and imported goods that minimizes the cost of obtaining a level of utility.

On the supply side, a comparable construction yields a CET function between domestically consumed (XD_i) and exported (E_i) goods:

$$X_i^D = A_i^T[\gamma_i E_i^{\theta_i} + (1-\gamma_i)XD_i^{\theta_i}]^{1/\theta_i}$$

where X_i^D is domestic output, A_i^T and γ_i are constants estimated from the without fish scenario data, and the elasticity of transformation between domestic consumption and exports is $\psi_i = 1/(1-\theta_i)$. Producers are assumed to maximize revenues from a given level of domestic production by allocating this production between domestic and export sales. For a regional economy the exchange rate is 1.0 (most of the trade appears as transactions with the rest of the U.S.) so export and domestic prices are identical.

The CGE model describes a regional economy within the U.S. economy. For a regional economy there are no trade deficits. Any difference between real imports and real exports is made up through the capital account as funds flow into the region or out of the region to balance the goods and services account.

d. Government Sector

The government sector consists of revenues generated through a set of principal tax sources: social security tax, other household taxes, indirect business taxes, and other enterprise taxes. Expenditures consist of transfers (to households and to enterprises) and government purchases of goods and services. The government demand for commodity i is:

$$G_i = \omega_i^G G$$

where G denotes total government consumption.

3. Model Closure

Several conditions must be met for an economy to be in equilibrium, and these are specified in the model closure conditions. Supply must equal demand in all markets (goods and factors), the external sector account must be in equilibrium (imports equal exports plus/minus capital account flows), and savings must equal investments. By Walras's Law one of these conditions is redundant. The current model omits the savings-equal-investment condition as the redundant closure condition. The government sector is permitted to run a debt financed through borrowing.

The current model also specifies some conditions as fixed in order to close the model. Capital is fixed by sector. Thus, the model solves for labor movements in response to exogenous shocks. Labor is freely mobile across sectors, and the labor market clears when aggregate demand equals aggregate supply. These assumptions are based on the fact that the direct impacts being evaluated are not large. In keeping with the SOE assumptions the flow of funds from outside the region are fixed at the inital levels. This condition is based on the fact that the regional economy, while large in absolute terms, is a fairly small part of the national economy.

4. Model Calibration - Functional Parameters

An implicit assumption of the CGE modeling approach is that the economy is initially in equilibrium prior to the policy shock being introduced. For this reason it is necessary to calibrate the model so that the model reproduces the input data. Calibration is not a trivial task as it involves reconciling diverse data sets and ensuring all of the parameters in the behavioral relations are consistent. The benchmark equilibrium data set is used to determine parameter values for production and demand functions. That is, the parameter values are chosen such that the model, when solved with the benchmark policy structure, will reproduce the benchmark equilibrium data set.

The Robinson approach permits the model to self-calibrate on the basis of the original input data. Thus, the parameters of the production function are estimated from the factor shares implied by the input data. The other behavioral equations are similarly calibrated. An advantage of this approach is that it does not rely on data obtained from sources outside those used to construct the model.[20]

G. The Colorado River Basin States CGE Model in Detail

1. Model Features

In this section the details of the CGE model constructed to assess the economic impacts associated with species listing and critical habitat designation along the Colorado River are described. The general features of the model are presented in this subsection with the specific discussion to follow.

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[20] One common practice is to employ CES production functions in which the elasticity of substitution values are obtained from a variety of external econometric studies. Potential problems introduced by this technique are frequently dealt with through sensitivity analysis.

There are a number of options one may take when faced with the task of constructing a regional CGE model for policy analysis purposes. One may take an existing national level model, or build a new national level model, and generate the regional impacts through a series of ratios from the national level data. The regional impacts constructed in this fashion will be certain to add up to the national impacts since $\Sigma_i R_i = N; i = 1, n$, where N denotes the national level impacts. This is known as a top-down approach. The principal advantage to the top-down approach is that several national models exist and may be employed. The disadvantages of this approach far outweigh the advantages. In particular, the theoretical foundations of this approach are questionable — there is no *a priori* reason to expect that a regional economy will be a constant ratio of the national economy over all sectors. As such, a national level model may not be well suited to regional analysis. The production relations, the households, and the government sectors may be unique to a particular regional economy. For this reason, we do not follow the top-down approach.

A second option is to construct a regional model that is designed to provide the type of analysis necessary to resolve the issue at hand. The national-level impacts are then obtained through an interregional model that explicitly captures the interregional trades within the U.S. This approach is theoretically very sound although there may be problems with adding up the impacts across several regions. That is, there is no automatic internal consistency check. A key advantage of this approach is that regional feedbacks are explicitly modeled. The chief drawback to this approach is that extensive data are needed to construct the disaggregated models. To model several sectors in the economy requires detailed interregional trade flows data.

Middle ground was adopted in constructing the CGE model for this project. The SOE assumption was used as the basis for constructing the model of the seven-State region. This is a well-developed approach that has the advantage of fairly modest data requirements while maintaining theoretical soundness. The linkages between the regional economy and the rest of the world are maintained through the assumptions implicit in the SOE approach: the region takes the world prices as given, and differences in products by origin are accommodated through the Armington functions. Since the bulk of the region's trade is with the rest of the U.S., the assumption of "world" prices is a reasonable one.

2. The Small Open Economy Approach

There are two ways to construct a regional model to account for linkages with the rest of the U.S. and the world. The first is to treat the region as a SOE for which "world" prices are taken as given, and all exchanges are assumed to occur at these prices. The second is to model the subject region and the rest of the world as distinct entities with the trade flows explicitly included. The SOE approach is adopted here for two reasons. The first is that it is theoretically sound. The second is that it is tractable — it is not necessary to know all of the bilateral trade flows for each sector of the economy. The SOE approach has been used in other research evaluating regional economic impacts.[21]

The SOE approach requires that Armington and constant elasticity of transformation (CET) functions be computed for all sectors of the economy for which goods are traded outside the region. The region was assumed to be a price taker in all 19 sectors. Thus, region and rest of U.S. prices are identical. The CGE model developed for the seven-State region uses the aggregation of economics sectors presented in Chapter 7. Given this level of aggregation, all of the sectors of the economy are characterized by simultaneous export of goods and the use of imports, and there are no non-traded goods. Thus, the Armington and CET assumptions are applied to all 19 sectors of the regional economy.

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[21] See Berck, Robinson, and Goldman.

3. Detailed Specification of the Colorado River Basin CGE Model

a. Structure

The economy consists of 19 producer sectors listed in Table II-7-3. This aggregation was chosen to allow examination of the impacts of listing and critical habitat.[22] There are 3 consumer groups classified by household income: High (greater than $30,001), Middle ($10,001-$30,000) and Low (less than $10,000). The external sectors are handled through imports of intermediate and final goods, exports of these goods, and "foreign" (primarily recorded as the rest of U.S.) capital flows. Government is presented as sectoral (indirect business) taxes, sectoral expenditures, transfers to households, and household taxes (including social security taxes).

b. The Input Data

The input data for the CGE model were derived from three sources. The IMPLAN data bases provided the data necessary to construct the inter-industry flows matrix (the input-output table) and the national accounts data that are required to construct the SAM. In addition, the production sectors required capital stock data and labor data. The labor data were included in the IMPLAN data base although adjustments were required to convert these data to full time jobs. The capital stock data were obtained from the *Census of Agriculture* and the BEA Wealth Data. Tax data for household and business taxes were included in the national accounts portions of the IMPLAN data bases.

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[22] The Health, Education, and Social Programs sector was added to the Government Industries sector as described in Chapter 7 due to difficulties with the measurement of capital in the Government Industries sector.

Table II-7-3. Producing Sectors Represented in the CGE Model

Sector	Industry
1	Livestock
2	Other Crops
3	Livestock Feed
4	Miscellaneous Agriculture
5	Non-Petroleum Mining
6	Petroleum and Natural Gas Mining
7	Construction
8	Combined Manufacturing
9	Food Products
10	Wood Products
11	Petroleum and Coal Products
12	Transportation, Communication, and Utilities
13	Recreational Services
14	Electric Power
15	Wholesale and Retail Trade
16	Finance, Insurance, and Real Estate
17	Household and Business Services
18	Local Amusements
19	Health, Education, Social Services, and Government Industries

c. The Region SAM

As noted above, there is no such thing as a general structure of a SAM. In each case, the sectors identified in the SAM are chosen with the application at hand in mind. The SAM is reported in Table II-7-4. It allows identification of impacts on households, enterprises, and agriculture (through the return to land) by comparing this initial value with the simulation results.

Table II-7-4. Initial Social Accounting Matrix[23]

	LAND	INDUSTRY	EARNINGS	PROFITS	ENTRPR
Land		3710.019			
Industry		271531.904			
Earnings		288904.578			
Profits		150386.837			
Entrpr	3710.019			92412.947	
HLow			16858.787		9933.837
HMid			150534.960		36890.349
HHigh			100385.106		35861.810
Govt			42420.775		23367.794
Invest				57973890	4718.810
Indtax		41209.891			
World		140212.341	-21295.050		
TOTAL	3710.019	895955.570	288904.578	150386.837	110772.601

+	HLOW	HMID	HHIGH	GOVT	INVEST
Industry	35773.308	123847.241	100994.519	75515.806	52646.386
Entrpr				14646.640	
HLow				24343.120	
HMid				24384.040	
HHigh				5426.060	
Govt	8837.019	38454.519	11958.979		
Invest	-5682.226	20991.715	11415.081	-20.228	
World	12695.799	32874.624	20211.061	21950.540	17233.140
TOTAL	51623.900	216168.099	144579.640	166248.978	69879.526

+	INDTAX	WORLD	TOTAL
Land			3710.019
Industry		235646.480	895955.644
Earnings			288904.578
Profits			150386.837
Entrpr			110772.606
HLow		488.156	51623.900
HMid		4358.751	216168.099
HHigh		2906.664	144579.640
Govt	41209.891		166248.978
Invest		-19517.595	69879.447
Indtax			41209.891
World			223882.455
TOTAL	41209.891	223882.455	

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[23] 1982 baseline values from IMPLAN data bases.

d. The Model

The mathematical structure of the model follows from the discussion in part B above. Some particular points may be noted here. Since the economy is assumed to be in equilibrium initially, the capital stock in each sector is adjusted to equate returns to capital across all sectors. Labor may be entered in one of two ways. First, labor is measured in efficiency units, and the result is that earnings are identical across all sectors and are equal to the average earnings in the economy. Second, labor is entered as jobs, and the earnings are allowed to vary across sectors.[24] Capital and land are assumed to be used in fixed proportions in the agriculture sectors. Closure (market clearing) conditions are provided by the balancing of supply and demand in the goods markets and the factor markets and also by the current account balance (external sector).

The model provides for two consistency checks in estimating the SAM. In the first instance, the SAM is defined by a set of equations that relates the flows of the various sectors using the inital data. A consistent data set will yield a SAM that is both square and consistent with that generated by the IMPLAN software and data sets.[25] If either condition is not met then the data must be adjusted. Such adjustments can be made on the basis of alternate data sets that can be consulted. Once the input data set has been made consistent, the model then solves for the equilibrium allocation. A second check is performed that verifies the correctness of the model itself. In this check, a SAM is estimated from the results generated by the equations of the model. With the initial data, this SAM should be identical to the initial SAM. Any deviation indicates that the model itself has errors. These must be corrected prior to using the model for simulation analysis.

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[24] This latter corresponds to the presence of non-pecuniary compensation for various occupations.

[25] Data inconsistencies arise due to the different bases being used, the different sources being consulted, and to some definitional differences. The linking of the input-output accounts to the national income and product accounts generally requires that some adjustments be made.

e. Simulations

The GAMS language facilitates conducting simulations. It allows variables to be specified as fixed at a particular level. The CGE model then solves for the remaining variables to produce a consistent allocation within the economy. In this way, the direct impacts associated with critical habitat and listing can be input directly into the model. This facility also allows the analyst to adjust variables that are fixed as part of the closure conditions of the model. The simulation results of the CGE model are discussed in Chapter II-13.

H. Appendix to Chapter II-7, Data Sources Used to Construct the Input-Output Models

1. IMPLAN

The principal data sources to generate the input-output models are derived from the IMPLAN Project data bases. IMPLAN was initially developed by the U.S. Department of Agriculture Forest Service and is now maintained at the University of Minnesota. The 1982 data bases were selected since this is the most recent year for which a complete data set is available.[26]

The IMPLAN software is capable of generating aggregated input-output models from user-developed aggregation templates. The selected aggregation design has been presented elsewhere. Once the input-output model has been constructed, IMPLAN is capable of producing a number of reports. The reports form the basis of the data used in the input-output model that was programmed in GAUSS. These IMPLAN-generated reports and their use in the GAUSS code are described in turn.

The matrix of inter-industry flows is labelled MID.402 (MID refers to the "model identification") in the IMPLAN reports series. This report requires some manipulation in a spreadsheet programs (e.g., Lotus 123) since IMPLAN generates data with page breaks and margins that enable it to be printed. The final demand components are reported in MID.403, but the required data must be extracted and organized to fit in the input-output code that was developed in GAUSS. IMPLAN reports consumption for three income classes (Low, Medium, and High), and these data are aggregated to yield total consumption. Similarly, IMPLAN reports several categories of government expenditure (State/local, Federal, education), and these are aggregated to yield total government expenditure. The investment data in IMPLAN consists of capital formation and inventory additions. These are aggregated to obtain the investment data for the input-output models. Exports in the input-output models are obtained by combining the domestic and foreign export figures reported in MID.403.

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[26] To maintain consistency between the I-O and the CGE modeling effort it was necessary to select a data base for which the social accounts matrix (SAM) was available. Although I-O data bases are available from IMPLAN for 1985 and (recently) 1990, the SAM's have not been generated for these periods.

The value added data from IMPLAN are reported in MID.404. These data consist of employee compensation, indirect business taxes, and return to investment (reported as proprietary income and other property income which are added to produce the return to investment data). Imports appear in MID.404 under several headings. For the input-output models developed for this project the total imports figures were used.

The sectoral employment data are reported by IMPLAN in MID.404. These were adjusted in some cases to reflect full-time equivalent employment levels.

2. Bureau of Economic Analysis (U.S. Dept of Commerce)

Two sets of data were obtained from the BEA for use in the input-output model stages. Although the IMPLAN data sets were for 1982, it was desirable to update the model to the most recent year for which good regional data were available. This was 1989 when this project was begun.[27] To update the 1982 input-output models the *Revised Gross State Product, Annual Estimates 1977-89* that are provided on computer diskette by the Bureau of Economic Analysis were employed. These disks provide (in constant dollar [1982 = 100] form) the following data: employee compensation; proprietors' incomes with adjustments for capital consumption allowances and inventory valuation adjustments; indirect business tax and non-tax liability; and other — mainly capital-related charges. These data were used to update the gross output figures in the input-output models, and then the models were used to update the remaining values to yield a completely specified 1989 input-output model.

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[27] The 1982 interindustry coefficients are maintained throughout the time period being studied. This assumes the production technology remains unchanged over this time period. This assumption is acceptable given the highly aggregated nature of the I-O model stages. That is, it is more likely that the production function for "combined manufacturing" has changed little than it would be that the production function for "electrical machinery" would be unchanged.

To generate projections for the study period (1989 - 2020), Bureau of Economic Analysis *Regional Projections to 2040* data diskettes were used. These disks provide projections for 1995, 2000, 2005, 2010, 2020, and 2040 of total personal income, population, and employment and earnings by industry. These data are provided for regions, States, and metropolitan areas. The series that related to the study region for each of the model stages was used as appropriate to generate the economic projections.

Volume II

Chapter 8: Input Data, Economic Aggregation, and Time Period

A. Introduction

All model stages of the economic impact analysis employ the same set of scenario projections. The without fish economic scenario consists of a projection of the levels of economic activity that would occur in the region if no species listing and/or critical habitat actions were undertaken. This projection covers the period through the year 2020. The biological projections concerning the endangered fishes indicated that recovery may take years. The with fish scenario economic projection incorporates potential action that may be taken on behalf of the endangered fishes. These scenarios allow a comparison of the without and with fish scenarios to obtain the net economic impacts associated with listing and the proposed critical habitat. An essential feature of the analysis is the linking of the biological requirements and the physical changes required to operate the river system to the economic impacts associated with protection and recovery of the endangered fishes.

B. Without Fish Projections

1. Physical Projections

The nature of the economic activities in the Colorado River Basin, as discussed in Chapters II-2 has led, over the century, to significant alterations in the physical and biological nature of the river. These alterations have, in turn, led to declines in the populations of the four endangered fishes. As noted in Chapter II-5, the Colorado squawfish and humpback chub were listed as endangered in 1967, and the bonytail was listed in 1980. The razorback sucker was not listed as endangered until 1991. Because several of the species have been listed for some time, it is possible that past protection and recovery actions have affected the regional economy.

Ideally, the economic analysis described in this report would be based upon contrasts in economic activity between the following scenarios:

1. Present and future economic activity assuming that none of the species had been listed and no critical habitat is designated (without fish scenario).
2. Present and future economic activity assuming that all four species are listed and critical habitat is designated for each (with fish scenario).

As a practical matter, however, it is not possible to determine what levels of economic activity would exist in the basin today had none of the endangered fish been listed. As a result, some simplifying assumptions were necessary to make the analysis tractable. These assumptions are described below.

A critical element of the analysis was the determination of the current hydrologic conditions of the river. This effort was undertaken by the USFWS, the Bureau of Reclamation, and Stone and Webster Consultants, Inc. This analysis formed the basis for the with/without flow effects framework. Figure II-8-1 presents the structure of the four flow scenarios.[28] The flow analytical scenarios are for both the Upper and Lower Basins and for the near term and long term. Thus, there are four structural scenarios: (1) current "without endangered fish," (2) a future "without endangered fishes," where projected depletions are allowed, (3) a current "with endangered fishes" but where no transfers of water for the endangered fish have yet occurred, and (4) a future "with endangered fish" where transfers have occurred for the fishes, and the level of depletions has been reduced from that projected in the "without endangered fish" scenario.

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[28] Note that the current conditions were defined in terms of a 19-year historical average for wet, dry and average years.

Figure II-8-1. Endangered Fish Analytical Scenarios

	Near Term (Year 1)	**Long Term (Year 20)**
Upper Basin		
Without Fish	X_1 = (1967-85) water years w/o fish	X_1 - Projected Depletions[1]
With Fish	X_2 = (1967-85) water years w/fish (no transfers)	X_2 + Transfers - Fewer Depletions[2]
Lower Basin		
Without Fish	Y_1 = 1967-85 water years w/o fish	Y_1 - Upper Basin Depletions & Arizona Depletions[3]
With Fish	Y_2 = 1967-85 water years w/fish	Y_2 - Fewer Upper Basin Depletions + Upper Basin

[1] Based upon projected Upper Basin depletions 20 years into the future without fish considerations.

[2] Based upon water transfers to meet fish needs and projected depletions in selected reaches.

[3] Based upon projected Upper Basin and Arizona depletions 20 years into the future without fish considerations.

Once the current hydrological conditions were determined, a critical element of the economic analysis involved assessing the impacts of alterations in the flow patterns required for recovery for the endangered fish. This involves assessing the impacts of revised operating plans of the dam system on recreation, hydroelectric generation, agriculture, municipal, and industrial water use. These assessments include modeling the hydroelectric generation of the Colorado River Basin for the without fish scenario case. This model effort then is perturbed to represent the flows that are believed necessary to recover the fish. It is through this form of analysis that the with/without cases are constructed.

2. Economic Projections

The data sets for the construction of the input-output and CGE models are largely derived from the IMPLAN data sets generated by the IMPLAN Project directed by the USDA Forest Service. The details of the application of these data to the I-O model stages and the CGE model were described in Chapter II-7. A complete IMPLAN data set was available for 1982 in 1982 constant dollars.[29]

The model structure used to investigate the economic impacts of the listing and proposed critical habitat involved the construction of 7 State-level I-O models, one Colorado River Basin-level I-O model, and the basin-level CGE model. Each model stage consists of 20 economic sectors (19 in the CGE model stage). All prices and values are in terms of 1982 dollars. Thus, the analysis reported in Chapters II-11, II-12, II-13, and II-15 are reported in 1982 constant dollars. This avoids the potential errors that may be introduced when dollar values are "inflated" to report outcomes in later bases (say 1992 dollars, for example).[30]

The Gross State Product data from the Department of Commerce, Bureau of Economic Analysis, was utilized to update the model to the 1989 (1982$) that would be used for the analysis. These data are available at a State level for the period from 1982 through 1989 for 73 sectors that can be matched (via Standard Industrial Codes) to the 20 sectors represented in the input-output models. In this way, the economic activity reported in the 1982 IMPLAN data set was updated to 1989 (in 1982$). The updated gross output levels were used to update the remaining components of the input-output models based on the 1982 coefficients and ratios.

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[29] Although the IMPLAN Group had I-O data sets available for 1985, there was no social accounts matrix (SAM) available for 1985. The SAM is an integral part to the construction of the computable general equilibrium model (see Chapter II-7 for a discussion). To have all model stages consistent required that the 1982 data bases be used and these formed the bases for all of the model stages.

[30] The potential sources of error are due to the mechanism of price inflation. Inflation is a general rise in the price level. However, the prices of different goods may rise by different rates. Indeed, some prices may fall while others are rising. It is necessary to apply sector-specific inflation, or escalation, factors in order to transform prices from one base (1982$) to another (eg, 1992$). If these escalation factors are not correct, then the relative prices across sectors will be distorted from their true values and analysis conducted with the resulting data base will give misleading results. It is preferable to conduct the analysis in 1982 constant dollars as this is the base for the input data sets and to recognize this when reporting and interpreting the results. To assist in this interpretation, many of the impact results in the later chapters are reported as percentage changes from the without fish scenario baseline projections.

The biological projections indicated that recovery would require many years. The time period for the economic analysis study selected is through the year 2020. A without fish projection of economic activity was generated for the period 1989 through 2020. This was accomplished by using the BEA Regional Projections data. These projections are published for the years 1995, 2000, 2005, 2010, 2020. The projection for 2015 was interpolated. In the projection, there are no endangered species effects. Water depletions (for agriculture, municipal and industrial, and other uses) are presumed to take place according to the development schedules as planned, hydroelectric generation continues as in the past, and all recreation activities also continue at historical levels.

The BEA projections report employment levels by State by economic sector. The employment/output ratios for each of the 20 sectors in the input-output model stages were calculated for the 1989 model year. These were used to derive the output levels for various years from 1989 through 2020 (1995, 2000, and so on) by multiplying these ratios and the employment projections generated by the BEA projections. Sectoral employment levels may be used to project output and other measures of economic activity, if certain basic assumptions are satisfied. A key assumption is that the relationship between employment and output (as well as the other relevant economic measures) remains constant over the period of the projections. This assumption was not satisfied for certain sectors.

In particular, for the agricultural sectors (1 through 4) the BEA projections are that employment in agriculture will fall over the next 20 years. A consensus forecast is that output is expected to remain constant or to rise slightly in these sectors. The decline in employment is due to various technological changes in agriculture. Accordingly, an adjustment factor was introduced for these sectors to capture the projected labor-saving technological changes and these adjustments are presented in Table II-8-1. The derived gross output figures were then used to generate the remaining without fish scenario projection data that would form the benchmark against which the impacts due the critical habitat impacts on economic activity within the respective region were compared.

The various projections and technical change adjustments that were made are presented in tables below. Table II-8-2 reports the BEA growth projections for the 1982 to 1989 time period. These projections were used to update the 1982 IMPLAN data sets to 1989, which then formed the basis of the 1989 input-output model. The regional employment growth projections are presented in Table II-8-3. Note that the BEA projects employment to decline in nearly all sectors by the period 2010 to 2020. This decline is especially marked in the resource sectors and in agriculture. These are the sectors which are projected to experience technologocal changes that will increase labor productivity. Thus, the decline in employment overstates the impacts in output. The technological change coefficients in Table II-8-2 capture this effect. The application of the factors in Tables II-8-1, II-8-2, and II-8-3 was explained in Chapter II-7.

Table II-8-1. Adjustment Factors to Capture Technological Change

	Period					
Sector	**1989-95**	**1995-2000**	**2000-05**	**2005-10**	**2010-15**	**2015-20**
Livestock	1.025	1.028	1.019	1.017	1.017	1.017
Other Crops	1.032	1.034	1.030	1.031	1.030	1.030
Livestock Feed	1.035	1.032	1.032	1.030	1.029	1.029
Misc. Ag.	1.001	1.001	1.001	1.002	1.002	1.002
Non-Petro Mine	1.009	1.010	1.010	1.009	1.009	1.009
Petro/Gas Min	1.009	1.009	1.007	1.005	1.005	1.005
Construction	1	1	1	1	1	1
Combined Mfg	1	1	1	1	1	1
Food Prod	1	1	1	1	1	1
Wood Prod	1	1	1	1	1	1
Petr/Coal Prod	1	1	1	1	1	1
Tr/Comm/Util	1	1	1	1	1	1
Recre. Serv.	1	1	1	1	1	1
Electric Power	1	1	1	1	1	1
Wholesale/Retail	1	1	1	1	1	1
F.I.R.E.	1	1	1	1	1	1
Household Bus	1	1	1	1	1	1
Local Amusements	1	1	1	1	1	1
Health/Ed/Soc Serv	1	1	1	1	1	1
Gov't Services	1	1	1	1	1	1

NOTE: F.I.R.E denotes Finance, Insurance, and Real Estate.
Source: Consensus from discussions of agriculture production projections.

Table II-8-2. BEA Regional Estimates of Gross Product Growth 1982 to 1989

	Model Stage - State Level						
Sector	**Arizona**	**California**	**Colorado**	**Nevada**	**New Mexico**	**Utah**	**Wyoming**
Livestock	1.29	1.21	1.19	1.28	1.26	1.16	0.85
Other Crops	1.29	1.21	1.19	1.28	1.26	1.16	0.85
Livestock Feed	1.29	1.19	1.19	1.28	1.26	1.16	0.85
Misc. Agric.	1.27	1.35	1.29	2.27	1.46	1.40	1.27
Non-Petro Mine	1.44	1.39	0.85	3.54	0.87	0.79	0.77
Petro/Gas Mine	1.66	0.92	0.80	1.45	0.81	0.51	0.50
Construction	1.16	1.35	0.64	1.80	0.81	0.84	0.40
Combined Mfg.	1.79	1.45	1.57	1.67	1.66	1.62	1.48
Food Prod.	1.23	1.25	1.19	1.13	1.18	1.42	1.00
Wood Prod.	1.81	1.35	1.20	1.87	1.46	1.22	1.54
Petr/Coal Prod.	0.78	1.51	2.76	0.90	1.61	2.06	2.09
Tr/Comm/Util.	1.75	1.49	1.37	1.58	1.25	1.39	1.16
Recreation Serv.	1.88	1.51	1.23	2.05	1.12	1.27	0.92
Electric Power	1.87	1.45	1.32	1.92	1.21	1.35	1.26
Wholesale/Retail	1.71	1.47	1.19	1.71	1.25	1.32	0.65
F.I.R.E.	1.47	1.42	1.00	1.44	0.94	1.04	0.72
Household Bus.	1.67	1.47	1.56	1.36	1.37	1.69	1.00
Local Amusements	1.99	1.48	1.48	1.02	1.37	1.65	1.82
Health/Ed/Soc Serv	1.39	1.48	1.18	1.50	1.19	1.26	1.00
Gov't Services	1.75	1.25	1.00	1.16	1.05	1.14	0.94

Sector	**Model Stage Basin**
Livestock	1.21
Other Crops	1.21
Livestock Feed	1.19
Misc. Agric.	1.35
Non-Petro Mine	1.39
Petro/Gas Mine	0.92
Construction	1.35
Combined Mfg	1.45
Food Prod	1.25
Wood Prod	1.35
Petr/Coal Prod	1.51
Tr/Comm/Util	1.49
Recreation Serv.	1.51
Electric Power	1.45
Wholesale/Retail	1.47
F.I.R.E.	1.42
Household Bus	1.47
Local Amusements	1.48
Health/Ed/Soc Serv	1.48
Gov't Services	1.25

Source: BEA, Revised Gross State Product, Annual Estimates 1977-89

Table II-8-3. BEA Regional Projects of Employment Growth
Change Over the Interval Seven-State Region

	Period					
Sector	**1989-95**	**1995-2000**	**2000-05**	**2005-10**	**2010-15**	**2015-20**
Livestock	-0.038	-0.023	-0.029	-0.031	-0.031	-0.063
Other Crops	-0.038	-0.023	-0.029	-0.031	-0.031	-0.063
Livestock Feed	-0.038	-0.023	-0.029	-0.031	-0.031	-0.063
Misc. Ag.	0.080	0.080	0.078	0.049	0.049	0.024
Non-Petro Mine	-0.020	-0.006	-0.012	-0.016	-0.016	-0.049
Petro/Gas Min	-0.049	-0.016	-0.016	-0.016	-0.016	-0.029
Construction	0.072	0.068	0.042	0.024	0.024	0.008
Combined Mfg	0.053	0.032	0.017	0.007	0.007	-0.010
Food Prod	0.020	0.011	0.008	-0.001	-0.001	-0.007
Wood Prod	0.094	0.054	0.033	0.017	0.017	0.002
Petr/Coal Prod	-0.009	0.003	-0.003	-0.002	-0.002	-0.012
Tr/Comm/Util	0.079	0.064	0.032	0.024	0.024	0.007
Recre. Serv.	0.107	0.091	0.075	0.047	0.047	0.022
Electric Power	0.094	0.068	0.036	0.020	0.020	-0.011
Wholesale/Retail	0.097	0.084	0.053	0.030	0.030	0.000
F.I.R.E.	0.092	0.073	0.048	0.030	0.030	0.000
Household Bus	0.092	0.084	0.054	0.033	0.033	0.030
Local Amusements	0.093	0.074	0.049	0.028	0.028	0.002
Health/Ed/Soc Serv	0.107	0.093	0.061	0.033	0.033	0.003
Gov't Services	0.063	0.040	0.002	0.030	0.030	0.021

Source: BEA *Regional Projections to 2040*

C. With Fish Impacts Data - Direct Impacts

1. Physical Impacts Data

As noted, the physical impacts consist of flow effects and non-flow effects (such as those generated by floodplain use restrictions, non-native fishes, and contaminants). Flow effects are potentially felt in the hydroelectric generation sector, recreation sector, and agriculture sectors. Non-flow effects are potentially felt in the recreation sector (non-native fishes and floodplain use restrictions), the oil and gas sectors (floodplain use restrictions and contaminants), and the construction sector (floodplain use restrictions). The flow-related effects are generated by changes in the hydrographs of the river system (see Chapter II-6).

All economic impacts stemming from flow effects are connected to the changes in the hydrographs. As discussed earlier in this chapter, the hydroelectric generation impacts generated by Stone and Webster Consultants, Inc. were derived from the hydrograph changes.

The recreation survey that was utilized to obtain information concerning the impacts within this sector also relied upon the hydrographs. The survey asked outdoor planners in the seven States and a variety of Federal agencies to assess the impacts of potentially modified operating plans on recreational activities in their respective areas of responsibility. Three versions were generated for different recreation units along the river:

(1) Units outside critical habitat areas but impacted by flow changes;

(2) Units including critical habitat areas and impacted by flow changes; and,

(3) Units including critical habitat areas but not impacted by flow changes.

Utilizing existing agricultural data and the biological flow recommendations it was determined if current and future agricultural requirements could be met with existing water resources in the relevant scenario cases. In cases where this was not possible, potential purchases of Upper Basin agricultural water rights were assumed, and the economic consequences to both Upper and Lower Basins agriculture were assessed.

Non-flow changes from the without fish scenario are assumed to be: oil and gas operations, mining operations (sand and gravel), construction of facilities (recreation and/or private dwellings), and the stocking of non-native fish are activities that might well impinge upon the recovery of the endangered fish.

2. Economic Impact Data

Each of the model stages consists of conducting a type of general equilibrium (or economy-wide) analysis. That is, economic interactions across the various sectors of the economy are captured by virtue of the theoretical foundations of the modeling approach. The inputs that represent the impacts arising from endangered fishes are generated in a variety of ways. These direct impacts are derived from what is termed partial equilibrium analysis. That is, the direct impacts that serve as inputs to the economic analysis are measured only within the affected sectors. The economic evaluation then generates the general equilibrium estimates of the economy-wide impacts of the endangered fishes. The methods of obtaining the direct impacts are described in the following discussion.

The major inputs are tied to the sectors that are expected to experience major direct impacts due to endangered species:

1. Electric Power Production - due to required changes in the hydrographs of the Colorado River and main tributaries;
2. Recreation Uses - due to hydrograph effects and also restrictions placed on floodplain use as well as on stocking programs;
3. Agriculture Production - due to flow requirements and potential changes in water-allowable depletions both present and future;
4. Oil and gas and other well activities - due to mitigation activity in current activities as well as future displacement effects potentially leading to losses in productivity.

a. Electric Power

Modeling the hydroelectric generation impacts required a cooperative effort among the USFWS, the Bureau of Reclamation, the Western Area Power Administration (Western), and Stone and Webster Consultants, Inc. The USFWS constructed a set of hydrographs to reflect the current hydrology of the river and a set to represent biologically desirable flows for endangered fish.[31] This analysis was carried out for ten USGS gaging stations on the upper Colorado River and its tributaries. The Bureau of Reclamation utilized this information to model the potential effects of flow requirements for the endangered fish on monthly hydroelectric generating capacity in the Upper Basin. The analysis was made using the Colorado River System Simulation (CRSS) model. Monthly hydroelectric generating capacity was estimated for four operational scenarios for Federal facilities that have been or will be impacted by operational changes for endangered fishes.

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[31] The methodology and data for this analysis are presented in Chapter II-6.

1. Reservoir operations that occurred during water years 1967 through 1985 without endangered fish considerations (current without fish scenario).

2. Reservoir operations that would have occurred during water years 1967 through 1985 with operational changes for endangered fish (current with fish scenario).

3. Reservoir operations projected to occur after future depletions are taken into account without endangered fish considerations (future without fish scenario). This scenario was constructed by subtracting depletions expected to occur by the year 2020 from water years 1967 through 1985.

4. Reservoir operations projected to occur after future depletions are taken into account but with operational changes for endangered fish (future with fish scenario). This scenario was also constructed by subtracting depletions expected to occur by the year 2020 from water years 1967 through 1985.

The rationale for using water years 1967 through 1985 hydrology data for the study is that no Federal reservoirs in the basin were reoperated to enhance flows for endangered fish prior to 1986.

The results of the CRSS model runs were utilized by Western to develop estimates of marketable power for each of the four operational scenarios described above. Stone and Webster Consultants, Inc. then developed estimates of the system-wide impacts of changes in hydroelectric generation availabilities. This analysis is described in the following paragraphs.

The electric power sector requires the use of an integrated analysis of power production from hydroelectric generation sources as well as thermal sources and of the transmission system as well as of the responses of the electric power utilities. This type of analysis requires an integrated power system analysis. The Stone and Webster Consultants, Inc. office in Denver undertook the electric power system analysis, and the results of that analysis were used as inputs to the economic analysis.[32]

The Stone and Webster Consultants, Inc. analysis employs a set of modules that enable evaluation of the system-wide response to changes in one particular electric power production sector. These modules are titled EGEAS, RISKMIN, STAFF/UPM, and DSMLINK[33]. The key module for purposes of the economic analysis is EGEAS, which incorporates production costing and generation expansion analysis. The heart of EGEAS is a dynamic programming algorithm. This algorithm is employed to obtain the least-cost means of meeting electric power supply subject to a series of constraints.[34] These constraints include reliability, loss of load, unmet energy, and reserve margins. The reserve margins are a key component since they form the condition for the addition of new capacity. The reserve margin is defined as the ratio of excess capacity to peak load. The minimum value of the reserve margin is determined by power pool regulations. A typical value is 18 percent. If the reserve margin falls below the level imposed by the power pool, then additional capacity is added, and the costs of this addition are passed through to the utilities.

EGEAS performs production costing through the use of load duration curves. There are several inputs to the production costing of electric power. Five resource types can be modeled: thermal (nuclear, fossil, and combustion turbine); hydro (conventional hydroelectric generation and limited energy plants); storage (pumped hydro, batteries, compressed air, superconducting magnets); non-dispatchable technology (solar, wind, run-of-the-river hydro and co-generation units); and DSM baseload technologies (DSM limited energy, DSM storage, and DSM non-dispatchable). Up to 200 fuel types can be modeled including fuel costs (per MBtu) with various dollar escalation factors.[35] Operating and Maintenance (O&M) costs are also input on an annual basis, and the EGEAS model allows a choice of maintenance schedules. The other inputs that the analyst is able to specify are heat rates (for up to 5 operating points), purchased power requirements, and forced outage rates. The purchased power requirements are modeled as a contract load with several options concerning the inputting of demand data.

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[32] Leslie Buttorff and Joel Theis provided their time very generously for several discussions concerning the power projections and the EGEAS model. Stone and Webster Management Consultants, Inc. have been involved in the Glen Canyon Environmental Impact Assessment. Their hydropower model is viewed as the industry standard. The Stone and Webster Consultants, Inc. effort was funded by the USFWS.

[33] EGEAS, Electric Generation Expansion Analysis; RISKMIN, Risk Minimizing; STAFF/UPM, Staffing/Utility Planning Model; DSMLINK, Demand Side Management Linker.

[34] The objective function is actually specified in the form of minimizing the revenue requirements of the utilities served by the power supply system. This is achieved when the production and delivery costs of electric power are minimized.

Generating units are loaded under the load duration curve according to operating costs with the least-cost units being added first and being run the longest. In this way the operating costs are minimized. As generating units are forced out of service (due to various factors), the power requirements are met from higher cost units. Thus, any losses in generating will result in higher costs since the base operation is at least cost.

EGEAS splits the study period into a planning period and an extension period. The user chooses the planning period (on the basis of data availability and other considerations), and EGEAS begins the extension period in the year following the planning period. The extension period projects the last of the planning period forward for an additional set of years.

The EGEAS model produces several reports that contain the data required as inputs to the economic analysis. Annual figures for electricity production, total revenues, and fuel requirements for thermal power are produced. The projections are supplied for the without fish and the with fish scenarios as produced by the Bureau of Reclamation hydrographs (Chapter II-6).

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[35] In practice Stone and Webster Consultants, Inc. purchase economic forecasts (including fuel cost escalation factors) from Data Resources Inc. We used these figures to convert the Stone and Webster Consultants, Inc. output to constant (1982$) dollar units that could be utilized in our modeling framework.

The final point regarding the EGEAS model is that it presents results for the large systems only. At the time the analysis described in Chapters II-11, II-12, II-13, and II-15 was being conducted, the only data available to the economics team were from the EGEAS model. The small system impacts were dealt with by multiplying the State-level large-system impacts by a factor of 2[36]. This approach implied that if there were no large-system impacts for a given State that there would be no small-system impacts projected. For these States, the electric power impacts were projected to be zero. This point is reiterated in Chapters II-9 and II-10.

The principal sources of electric power generation in the region are hydroelectric and thermal (chiefly coal and gas). Stone and Webster Consultants, Inc. have evaluated the impacts of endangered fishes in terms of power production and the costs of producing the power in the regional economy. The principal electric power impacts of proposed critical habitat designations and recovery efforts for endangered fish will be on hydroelectric generation. Release patterns for many of the large Federal reservoirs in the Basin either have been or will be modified to promote recovery of endangered fish. These operational changes have affected and will affect hydroelectric generation. Four operational scenarios were run using the EGEAS model. These scenarios are:

B1 - Current levels of river depletions without flow alterations for endangered fish
B2 - Future levels of depletions without flow alterations for endangered fish
C1 - Current levels of depletions with flow alterations for endangered fish
C2 - Future levels of depletions with flow alterations for endangered fish

The Stone and Webster Consultants, Inc. projections report total power produced by fuel type (hydroelectric generation is considered a fuel type), and the costs incurred in producing this power for regional utilities depended upon hydroelectric generation from affected

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[36] This method was suggested, in personal communication, by Joel Theis of Stone and Webster Consultants, Inc. Further data regarding small system analysis was recently received. This information will be incorporated into the economic analysis after the public comment period. Preliminary simulations suggest the incorporation of this data primarily effects the distribution of impacts but does not alter the overall results.

Colorado River Basin facilities. Supplemental information was produced concerning the capacity additions required during the study period.

The electric power impacts of proposed critical habitat designations and recovery efforts for endangered fish were obtained by comparing the without fish to the with fish scenario. For this draft report, however, there was insufficient time to produce accurate estimates of water availability, hydroelectric generation under Scenario C2, future depletions, and flow alterations with endangered fish. In reality, managing the Colorado River System for endangered fish may reduce future depletions in some river reaches and thus make more water available for hydroelectric generation than would otherwise be the case. The electric power impacts described in this draft report, however, assume that depletion levels will be the same in the with and without fish scenarios. Thus, the electric power impacts described herein somewhat overstate the impacts that may actually result.

The general results for the electric power sector for the Colorado River Basin States may be briefly stated here. The endangered species considerations result in a reduction in the power that is generated using hydroelectricity. This reduction is made up, in part, through increases in thermal generation. The overall cost of generating the electric power is projected to increase as a result. Capacity additions in thermal generation are required to meet the additional output requirements from these sources. Stone and Webster Consultants, Inc. report that 121 MW of net additional capacity are required under C2 compared with B2. That is, this capacity will need to be added during the study period (1995 - 2020) under the with fish scenario.

b. Recreation

The primary recreation impacts, obtained via the various surveys, were projected to occur in rafting and fishing activities. Rafting could be directly affected through flow and flow timing effects. Fishing activity could be directly affected through flow and flow timing effects as well as through possible restrictions on nonnative fish stocking.

Data were gathered through direct surveys of individuals with knowledge of the existing recreation activity and the potential effects of alterations in the flows or flow timing of the rivers and changes in stocking activity. Rafting companies and guides were surveyed via personal interview to collect data on projected changes in rafting activity and to place a dollar value on these impacts. Management area officials were surveyed via a mail survey to obtain data on changes in recreation activity (visitor days) that were projected to accompany the listing and projected critical habitat effects. The existing levels of activities were also obtained from these sources. State fishing agencies were interviewed using a survey mechanism to determine impacts from nonnative fish stocking restrictions.

c. Agriculture

Impacts in the agriculture sectors were generated by the projected changes in the hydrographs that were made to protect and recover the endangered fishes. That is, if water flows in the rivers were not sufficient to meet the projected hydrographs, then water was withdrawn from agricultural production (lowest valued crops first). The actual reductions in agriculture were based on local cropping patterns. These data were obtained from the various State agricultural extension offices. The prices that were applied to the changes in quantity were obtained from agricultural extension offices.

d. Oil and Gas

There is significant oil and gas development in the Colorado River Basin. Little, however, is known regarding the effects of listing and critical habitat designation on the overall production. The recently signed "Formal Section 7 Consultation Biological Opinion for the Proposed Permitting of Oil and Gas Activities" issued by the Regional Director of the USFWS Albuquerque, New Mexico office is an indication of this dilemma. The consultation calls for three phases for oil and gas permitting: (1) Phase 1 is to determine the types and amounts of the contaminants in the region; (2) Phase 2 is to identify sources for which remediation is to follow; and (3) Phase 3 is to institute a long-term monitoring program.

The potential impacts to society of the additional cost of production resulting from species listing and/or proposed critical habitat designation would be measured by a permanent loss of production. A marginal production facility that is closed due to increased monitoring or remediation costs represents a loss of production in the short term. Thus, the critical determination for well-related impacts resulting from contaminants is the percentage of producing wells that will be capped and, as a result of closure, the actual production that will be lost. Given that the Farmington District is representative, then little is known regarding the impacts.

D. Technical Issues Concerning the Economic Analysis

1. The Choice of Time Period

The impacts from listing and critical habitat designation will occur over a period of time due to the length of time required to recover the endangered fishes. Thus, the study period runs through the year 2020. While impacts are projected to occur throughout the study period, it is also the case that initial impacts may be moderated or exacerbated in the future as restrictions are relaxed or as further restrictions are imposed. The direct impacts may also be mitigated through responses of economic agents (households and firms) engaged in activities within the affected economic sectors.

The relevant time period for the study was determined on the basis of several factors: the biological projections concerning recovery of the fish species, the availability of data to generate economic projections, the pragmatic concern with the accuracy of long-term forecasts, and the role of discounting future impacts to arrive at a present value of the stream of impacts. To evaluate the long-run effects of the endangered species, the counterfactual technique is employed. As discussed above, a projection is made of the level of economic activity that would exist in the absence of the endangered species. This projection is compared with the projection of the estimated impacts that accompany the endangered species adjustments.

The time period for the study extends from 1989 through 2020. This time period was selected on the basis of several considerations. In particular, the projected time for species recovery and the reliability of the data used for economic projections must be taken into account. The recovery of the species will take some time to achieve (see the various recovery plans). During this time there will be various impacts associated with endangered species. To compare the with fish and without fish economic futures on a common basis requires that all future values be discounted to yield present value estimates. At conventional discount rates, effects beyond 2020 will have very little weight in this comparison. The without fish scenario projection utilizes projections of general economic activity that are published by the BEA. The reliability of such projections diminishes as the time period is extended.

2. Sectoral Aggregation

The IMPLAN input-output data base which is used to underlie both the input-output models and the CGE models is comprised of 528 producing sectors. To facilitate the analysis of impact scenarios, this number necessarily was reduced. Such reduction is accomplished through aggregation of the producing sectors in the economy into a more manageable number. Several considerations affect the level of sectoral aggregation that is undertaken.

The analysis or evaluation task is one determinant of the appropriate level of aggregation and the manner in which the aggregation is performed. In general, it is desirable to aggregate those sectors that are not of direct interest in order to arrive at a level of detail that is manageable conceptually. Conversely, sectors that are of interest to the task at hand must be maintained. Thus, the aggregation scheme adopted for this analysis retains several key agricultural sectors, the recreation sector, the electric power sector, and some mining sectors.

In aggregating sectors, the analyst is assuming that the production functions are identical across the sectors within the aggregated sector. Thus, care must be taken when an aggregation is applied to avoid grouping together production sectors that are characterized by markedly different production functions. This concern is balanced against the need to reduce the number of sectors to a manageable set. The result of this balancing is the aggregation scheme presented below.

For each stage of the input-output modeling process as well as the CGE model, 20 economic sectors were employed, and these were derived from the original 528 using the IMPLAN aggregation methodology. The 20 sectors are reported in Table II-8-4.

Table II-8-4. Industrial Sectors Represented in the I-O Model
20 Industry Categories for Input-Output Models

Sector	Industry
1	Livestock
2	Other Crops
3	Livestock Feed
4	Miscellaneous Agriculture
5	Non-Petroleum Mining
6	Petroleum and Natural Gas Mining
7	Construction
8	Combined Manufacturing
9	Food Products
10	Wood Products
11	Petroleum and Coal Products
12	Transportation, Communication, and Utilities
13	Recreational Services
14	Electric Power
15	Wholesale and Retail Trade
16	Finance, Insurance, and Real Estate
17	Household and Business Services
18	Local Amusements
19	Health, Education, and Social Services
20	Government Industries

Note: Sectors 19 and 20 were combined for the CGE Model.

This aggregation structure permits investigation of the changes in the economic activity of the sectors in the study region that were expected potentially to incur the major direct effects due to critical habitat. The electric power industry is represented in sector 14, oil and gas production is sector 6, construction is sector 7, and agriculture in sectors 1 through 4. Recreation appears as sector 13. This sector includes activities that are most likely to be undertaken by visitors to the region. Another sector is called "Local Amusements" (sector 18), and this sector covers activities that are more frequently associated with residents of the region. The components of the aggregated sectors are listed below. In view of the importance of the agriculture sectors in the current project, it is useful to relate the components of the aggregated sectors (see Table II-8-5).

Table II-8-5. Components of the Aggregate Agriculture Sectors

1. Livestock:
    - i. dairy farm products
    - ii. poultry and eggs
    - iii. ranch fed cattle
    - iv. sheep, lambs, and goats
    - v. cattle feedlots
    - vi. hogs, pigs, swine
    - viii. other meat animal products
    - ix. miscellaneous livestock
2. Livestock Feed:
    - i. feed grains
    - ii. hay and pasture
3. Other Crops:
    - i. cotton
    - ii. food grains
    - iii. grass seed
    - iv. tobacco
    - v. fruits
    - vi. tree nuts
    - vii. vegetables
    - viii. sugar crops
    - ix. miscellaneous crops
    - x. oil bearing crops
4. Miscellaneous Agriculture:
    - i. forest products
    - ii. greenhouse and nursery products
    - iii. forestry products
    - iv. commercial fishing
    - v. agricultural, forestry, fisheries services
    - vi. landscape and horticultural services

3. Spatial Aggregation

The spatial organization reflects the goals of the evaluation in terms of being able to report effects that would occur within a given State and within the entire region. The direct impacts associated with critical habitat will be concentrated within the area immediately within the Colorado River Basin. However, the indirect (and induced) effects will extend beyond the immediately affected area. For this reason, the analysis was conducted at the State and regional levels. Finally, the input-output stages permit investigation of the effects of spatial substitutions and offsets.

IMPLAN is capable of generating county-level data sets. However, the indirect effects often occur beyond the county that experiences the direct impact. Thus, it is necessary to direct attention to the larger region. The State was judged to be the smallest region that would provide meaningful results, particularly relating to fiscal impacts.

Accordingly, the seven individual States were modeled separately. However, the potential exists for offsetting responses across several States. The extent of these offsetting effects depends on the economic linkages across the States and the degree of substitutability of economic activities across the respective States. Finally, since the river water is essentially fully appropriated by the time it leaves the U.S. (subject to Mexico's allocation of 1.5 million acre-feet), it is useful to evaluate impacts, if any, from altering the operation of the river from the perspective of the entire seven-State region.

Input-output models are useful for analyzing the impacts of exogenous changes in the economy. However, input-output models omit much that may be considered important when national economic effects are being considered. For this reason a computable general equilibrium (CGE) model was constructed of the entire seven-State region.

E. Appendix to Chapter II-8

The 20-Sector Aggregation Scheme

Model Sectors	IMPLAN Sector Numbers
1 Livestock	1 2 3 4 5 6 7 8 9
2 Other Crops	10 11 14 15 16 17 18 19 20 21
3 Livestock Feed	12 13
4 Other Agriculture	22 23 24 25 26 27
5 Non-Petroleum Mining	28 29 30 31 32 33 34 35 36 37 38 39 40 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
6 Petroleum and Natural Gas Mining	41 42 43
7 Construction	66 67 68 69 70 71 72 73 74 75
8 Combined Manufacturing	76 77 78 79 80 81 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 178 179 181 184 185 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 522 523 524 526 528
9 Food Products	82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130
10 Wood Products	160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 180 182 183 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209
11 Petroleum and Coal Products	235 236 237 238 239
12 Transportation, Communication and Utilities	446 448 451 454 455 457 458 459
13 Recreation Services	447 449 450 452 453 460 462 471 491 492

The 20-Sector Aggregation Scheme

Model Sectors	IMPLAN Sector Numbers
14 Electric Power	456 517 520
15 Wholesale and Retail Trade	461 463
16 Finance, Insurance, and Real Estate	464 465 466 467 468 469 470
17 Household and Business Services	472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 493 494 527
18 Local Amusements	495 496 497 498 499 500 501 502
19 Health, Education and Social Services	503 504 505 506 507 508 509 510 511 512 513 514 515
20 Government Industries	516 518 519 521 525

Note: The 19 sector aggregation scheme employed in the CGE model adds sections 19 and 20 of the 20-sector scheme. All other sectors are identical.

Volume II

Chapter 9: Direct Economic Impacts — Upper Basin

A. Introduction

1. Scope

This chapter discusses the direct economic impacts that are expected to accrue to the economics of the four Upper Colorado River Basin States: Colorado, New Mexico, Utah, and Wyoming. The term "direct impacts" refers to direct changes in economic output, earnings, and employment that are expected to result from the combined effects of species listing and proposed critical habitat designations for the four endangered fishes. Direct economic impacts do not include the indirect multiplier effects of listing and critical habitat designations on the State economies.

Estimating the direct economic impacts of listing and proposed critical habitat designations poses formidable challenges because most economic impacts will result from future Section 7 Consultations under the auspices of the Endangered Species Act. This law requires all Federal agencies to ensure that their future actions are not likely to jeopardize the endangered fishes or adversely modify their critical habitat. These judgments are typically made on a case-by-case basis during Section 7 Consultations, and it is impossible to predict the outcome of all future Section 7 Consultations concerning endangered fishes in the Colorado River system[37].

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[37] In the event a project is re-visited, formal Section 7 consultation must be re-initiated on these projects if:

a. New information reveals effects of the project that may affect listed species of critical habitat in a manner or to the extent not previously considered;

b. The project is modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or

c. A new species is listed or critical habitat designated that may be affected by the project.

Decisions to re-initiate Section 7 consultation would be determined by the USFWS on a case-by-case basis. For the purposes of this economic analysis, it was assumed that prior consultations would not be affected.

To provide a basis for the economic analysis, however, it was necessary to make some assumptions concerning the outcomes of these future consultations. As background for those assumptions, it is useful to review the history of the Endangered Species Act as it has been implemented with respect to endangered fishes in Upper Basin States.

2. Background

a. Section 7 Requirements

Consultation with the USFWS under Section 7 of the Endangered Species Act is initiated when a Federal agency determines that an activity it will authorize, fund, or carry out may affect a listed species or its critical habitat. The USFWS then issues a biological opinion finding that the action either is or is not likely to jeopardize the continued existence of the listed species or to destroy or adversely modify its critical habitat. If the USFWS determines that the action is likely to jeopardize the continued existence of the listed species, or to destroy or adversely modify its critical habitat, then it also develops reasonable and prudent alternatives that would avoid a jeopardy, or adverse modification situation, if such alternatives are available.

b. Section 7 Consultation on Upper Basin Water Projects

Since 1981, the USFWS has consulted on approximately 200 water projects in the Upper Basin. The USFWS has consistently maintained that additional depletions from the Upper Basin are likely to jeopardize the endangered fishes. However, the USFWS has been able to develop reasonable and prudent alternatives that allowed each of these projects to go forward. These alternatives have included allocating funds to support recovery efforts, conducting research studies, providing instream flows to benefit the endangered fishes, and implementing comprehensive recovery programs for the endangered fishes.

c. The Upper Basin Recovery Implementation Program

The Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) is a cooperative effort to recover the endangered fishes in the Upper Basin while providing for water development to proceed in a manner compatible with applicable State and Federal laws. The Recovery Program was implemented in January 1988 by a Cooperative Agreement signed by the Governors of Colorado, Utah and Wyoming, the Secretary of the Interior, and the Administrator of the Western Area Power Administration. The process for conducting Section 7 Consultations on water projects in the Upper Basin was outlined in the Recovery Program and further clarified by a March 11, 1993, draft agreement on Section 7 Consultation.

The Recovery Program is intended to provide and has provided the reasonable and prudent alternative which avoids the likelihood of jeopardy to the continued existence of the endangered fishes resulting from depletion impacts of new projects and all existing or past impacts related to historical projects (with the exception of the discharge by historical projects of pollutants). Program participants also intend that the Recovery Program will provide the reasonable and prudent alternative that will avoid the likely destruction or adverse modification of critical habitat currently being designated for the endangered fishes. A draft Recovery Action Plan (RIPRAP) that identifies specific actions and time frames needed to recover the endangered fishes was developed and will serve as a measure of progress so that the Recovery Program continues to serve as a reasonable and prudent alternative to jeopardy. It is intended that once critical habitat for the endangered fishes is formally designated, the RIPRAP will be amended to serve as the reasonable and prudent alternative to avoid the likely destruction or adverse modification of critical habitat. The USFWS considers that the Recovery Program has made sufficient progress to serve as a reasonable and prudent alternative to jeopardy for projects that deplete less than 3,000 acre-feet. For projects depleting more than 3,000 acre-feet, the USFWS identifies actions in the RIPRAP which must be completed to avoid jeopardy.

To fulfill its purpose of achieving recovery and serving as a reasonable and prudent alternative, the Recovery Program proposes to spend $75 to $130 million over the next 10 years (the Fiscal Year 1994 budget is $7.7 million). These funds will be used to conduct such activities as acquiring/designating instream flows, providing fish passage to historic habitat that has been blocked by dams and diversions, restoring historically flooded bottomland habitat important to fish growth and survival, reducing negative impacts of nonnative fishes on the endangered fishes, establishing captive populations of the endangered fishes, reintroducing endangered fishes into restored habitat where they previously were extirpated, monitoring fish populations, and conducting needed research.

d. The San Juan River Recovery Implementation Program

As a result of reasonable and prudent alternatives provided in the October 25, 1991, Biological Opinion issued by the USFWS on the Animas-LaPlata Project, the Bureau of Reclamation agreed to fund seven years of research and to develop a recovery implementation program for the San Juan River. On October 24, 1991, a Memorandum of Understanding was executed by the USFWS, the Bureau of Reclamation, the Bureau of Indian Affairs, States of Colorado and New Mexico, the Ute Mountain Indian Tribe, the Southern Ute Indian Tribe, and the Jicarilla Apache Indian Tribe to set forth certain agreements and to establish a San Juan Recovery Implementation Program (SJRIP). The SJRIP provides the basis for the recovery of the endangered fishes of the San Juan River.

The seven-year research effort focuses on observing the biological response in endangered fish populations and habitat conditions after the reoperation of Navajo Dam to meet the needs of the Colorado squawfish and razorback sucker. The recovery elements define the major categories of activities that will be conducted to recover endangered fish species and maintain the native fish community in the San Juan Basin. Intensive studies are being conducted by the SJRIP to determine the relative abundance and distribution of endangered fishes, and other native and nonnative fishes. Modification and loss of habitat, fish poisoning, and nonnative fishes have contributed to the decline of the Colorado squawfish and razorback sucker in the San Juan Basin. Regulating structures such as Navajo Dam can be operated to control river flow and temperatures to affect the quantity and quality of habitats in certain river reaches during periods when they are most crucial to endangered fish species. After determining appropriate flow needs, the Biology Committee of the SJRIP, with input from the Bureau of Reclamation, will recommend specific flow regimes to the USFWS. It is anticipated that the source water for habitat improvement will be derived primarily from the reoperation of Navajo Dam.

Based upon the results of the research, the Bureau of Reclamation has agreed that it will operate Navajo Dam to mimic a natural hydrograph, provided that research shows this type of hydrograph is beneficial to recovery of endangered species. If habitat flow needs are identified that cannot be met by reoperation of Navajo Dam, additional potential sources of water to meet those needs will be identified on a case-specific basis. The success of the SJRIP is contingent upon the legal protection of water released for habitat flows pursuant to Federal, State, and tribal laws.

3. Study Assumptions

The magnitude and type of future economic impacts in the Upper Basin due to listing and proposed critical habitat designations will be determined by future Section 7 Consultations. The USFWS has reasonable and prudent alternatives (such as the Upper Basin and San Juan RIPs) to allow water development to proceed in compliance with the Endangered Species Act. It is anticipated that future water development projects in the Upper Basin will proceed on the same basis. On the other hand, if the Upper Basin and San Juan River RIPs do not show sufficient progress in recovering endangered fishes, it may be difficult to find other reasonable and prudent alternatives for future projects. In that case, a number of planned developments in the Upper Basin may be modified, scaled back, or foregone.

The magnitude of economic impacts attributable to listing and proposed critical habitat designations for endangered fishes is thus largely a function of the future success of the RIPs in recovering endangered fishes. Because the future success of these programs is unknown at this time, the economic analysis described in this chapter is based upon the conservative assumption that the RIPs will not show sufficient progress in recovering endangered fishes in the future, and some planned water developments may be foregone to ensure the recovery of endangered fishes. This assumption provides an upper bound on the potential magnitude of direct economic impacts.

4. Impact Assessment

Listing and proposed critical habitat designations for endangered fishes can potentially affect economic activity in the Upper Basin in several ways. As discussed above, one set of potential effects involve the outcome of Section 7 Consultations on proposed Federal water development projects in the basin. Such consultations may affect the ability of project sponsors to develop water resources as planned or to impose additional costs on such development. Other impacts may stem from Section 7 Consultations on State (with and Federal nexus) and Federal programs related to the management of water resources in the basin. For example, operational plans for Federal reservoirs have come under scrutiny in recent years in an attempt to provide downstream flow regimes conducive to the reproduction and survival of endangered fishes. Furthermore, sport fishery management plans adopted by State game and fish departments may be affected to the extent that such plans may trigger Section 7 Consultations and would jeopardize the species or adversely modify essential elements of critical habitat.

The potential direct economic effects stemming from these different types of Section 7 Consultations are equally varied. Changes in the operational plans of some Federal reservoirs in the basin have affected and will continue to affect hydroelectric generation at those reservoirs, as well as the recreational use of downstream rivers. Future Section 7 Consultations may affect plans to consumptively use Colorado River waters in various States, and changes in these plans will also affect downstream hydroelectric generation and recreational uses of the river. The ability of State game and fish departments to stock nonnative fishes in waters containing populations of endangered fishes may be affected by Section 7 Consultations. Furthermore, such consultations may affect recreational and commercial uses of the floodplain in proposed critical habitat areas.

The following sections of this chapter describe the potential direct economic impacts of future Section 7 Consultations in the Upper Basin on the economies of Colorado, New Mexico, Utah, and Wyoming.

B. Colorado

1. Introduction

The State of Colorado contains the headwaters of the Colorado River and four tributaries of importance to endangered fishes: the Gunnison, the San Juan, the White, and the Yampa rivers. The lower reaches of all five rivers have been proposed as critical habitat for endangered fishes, and those designations may affect economic activities within the floodplain and future diversions above critical habitat reaches. The extreme northwestern corner of Colorado also contains a short section of the Green River in Dinosaur National Monument that has been proposed as critical habitat for endangered fishes. This section of the Green River is discussed in the State of Utah impact sections of this report.

Colorado electric power users may also be affected by changes in hydroelectric generation that result from managing Federal reservoirs in the Colorado River Basin to enhance flows for endangered fishes. Projections of electric power impacts are available only at the State level and are discussed in Section B.2, below. Succeeding sections discuss other impacts attributable to endangered fish recovery efforts as they affect specific river basins.

2. Electric Power Impacts

Colorado electric utilities and their customers rely heavily upon hydroelectricity generated at Federally operated dams in the Colorado River Basin. As a result, the Colorado economy will be affected by the reoperation of these facilities to provide flows to recover endangered fishes. The magnitude of these effects ranges from losses of $1.98 millions to $8.19 millions during the study period (1989 - 2020). There are offsetting impacts in the substitute fuel categories (coal and gas used in thermal electricity generation). These positive impacts range from a low of $0.25 millions in the year 2000 for gas to a high of $6.54 millions in the year 2015 for gas.

Additional thermal capacity is projected to be required to replace some of the hydroelectric generation lost due to listing and proposed critical habitat designation for endangered fishes. Stone and Webster Consultants, Inc. have projected an additional 121 MW of capacity will be required basinwide, and some additional capacity would be constructed in Colorado. These capacity additions will be added over time and have the effect of stimulating economic activity in the construction and combined manufacturing (the source of capital equipment) sectors of the economy. Output in each of these sectors is expected to increase by approximately $6.35 million annually over the study period.

3. The Colorado River

a. Introduction

The headwaters of the Colorado River lie in the mountains of Rocky Mountain National Park in Grand County, Colorado. From there the river flows southwesterly through Eagle, Garfield, and Mesa counties to the Utah State line. The lower portion of the river from Rifle (river mile 238) downstream to the Utah State line has been proposed as critical habitat for endangered fishes. The direct economic effects of listing and this proposed critical habitat designation are discussed below.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes at the Cameo gage are depicted in Chapter II-6 for an average water year. As that figure shows, actual peak flows in an average water year are significantly below the biological needs of the fishes. Furthermore, actual flows in an average year are significantly higher than required during the month of July. The divergence of actual and biologically needed flows reflects the effects of upstream developments for agricultural, municipal, and industrial use and return flow patterns from irrigation.

During the 19-year period from 1967 through 1985, flows in the Colorado River at Cameo met or exceeded the biological recommendations only five times on an annual average basis. Those five years all coincided with high runoff events. In the remaining 14 years of the study period, flows at Cameo were significantly less than those needed to meet the biological needs required for endangered fishes. It is not known exactly how often biological flow targets need to be met to ensure recovery of endangered fishes. Nevertheless, under historical flow conditions, populations of endangered fishes in the upper Colorado River have continued to decline. Unless this decline can be reversed under provisions of the Upper Basin RIP, there may be impacts to the Colorado economy from foregone water development.

According to the Bureau of Reclamation, depletions of the Colorado River in Colorado are expected to increase from 870,000 acre-feet in 1993 to 1,072,000 acre-feet by the year 2020 (Bureau of Reclamation, 1992). Most of the 202,000 acre-foot increase in depletions is expected to come from projects on upper Colorado River tributaries that have already undergone Section 7 Consultations with the USFWS under the auspices of the Endangered Species Act. These projects would not be affected by proposed critical habitat designations, unless the Section 7 Consultation is reinitiated where there is a continued Federal nexus (see footnote 1 in Section A.1). For this analysis, it was assumed that prior consultations would not be affected.

Potential diversions that have not undergone Section 7 Consultations include approximately 71,000 acre-feet of water intended for municipal use in the Denver Metropolitan area of the Colorado front range. Most of the water probably would be diverted through the existing Moffatt and Roberts Tunnels and would require few if any additional facilities in the Colorado River drainage (CWCB, 1993). In all likelihood, however, new storage and/or distribution facilities needed along the front range would involve Federal actions that would trigger consultations under the Endangered Species Act. If sufficient progress has not been made under the RIP in reversing population declines in Colorado River endangered fishes, the greater Denver area may have to forego some planned development of Colorado River waters for municipal use.

The impact of this foregone development may be to hasten the trend toward transferring agriculture water rights to municipal and industrial use along Colorado's front range. The value of agriculture output that would be needed to replace 71,000 acre-feet of Colorado River water annually was estimated using typical front range irrigated cropping patterns, yields, and consumptive irrigation requirements. The actual amount of irrigated acreage that would be affected depends upon future determinations of transferable consumptive use by Colorado Water Courts. Assuming that 1.75 acre-feet of agricultural water per acre could be transferred to municipal use, 40,570 acres of irrigated lands along the Colorado front range would have to revert to dryland crop production to replace the foregone Colorado River diversions. The resulting reduction in State agricultural output would rise from $5.9 million in the year 2000 to $15.0 million by the year 2020.[38]

No other currently planned depletions of the Colorado River in Colorado should be affected by endangered fish recovery efforts. Although long-range plans have been developed by private interests to utilize Colorado River water in the Grand Valley for oil shale development, no depletions of this type are projected before the year 2040. The recovery horizon for endangered fishes as envisioned by the USFWS occurs before the year 2040. Thus, based upon current projections, there may be no direct conflicts between Colorado synthetic fuels development and recovery of endangered fishes according to current timetables. Although some protection mechanisms will remain in place after recovery, more latitude with respect to depletions may be available in the time frame for development of oil shale resources in the region.

c. Recreation

Recreational activities along the Colorado River in Colorado will not be significantly affected by endangered fish recovery efforts. Upstream from Rifle, there would be no immediate changes in recreational opportunities because the flow regime of the river would remain unchanged. In the longer term, recreational opportunities above Rifle may benefit from recovery efforts because projected depletions that could adversely affect recreation are less likely to occur. The magnitude of these potential benefits is unknown.

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[38] Agricultural output impacts for the Colorado front range were estimated from cropping patterns, yields, crop prices, and water requirements for crops in Weld County. Cropping patterns were derived from the U.S. Census of Agriculture for 1982 and 1987. Yields were estimated from data reported in *Colorado Agricultural Statistics*, compiled annually by the Colorado Agricultural Statistics Service, for the years 1986 through 1991. Crop prices were taken from the *Agricultural Prices Summary*, published by the National Agricultural Statistics Service, for the years 1989 through 1991. Water requirements for irrigated crops were based upon information in the *Colorado Irrigation Guide* (1988), published by the Soil Conservation Service of the U.S. Department of Agriculture. A nominal opportunity cost for dryland farming and grazing was deducted from the impact projections.

The Colorado River downstream from Rifle will experience relatively few changes in recreational opportunities. From Rifle to the Utah State line, the location of new recreational facilities in the 100-year floodplain may be affected. From the Gunnison River confluence to the Utah State line, some minor flow changes will occur due to the effects of managing Federal reservoirs on the Gunnison to meet flow recommendations for that river.

The effects of Gunnison River flow changes on Colorado River flows at the State line are depicted in Chapter II-6. The slightly higher spring peak flows and lower winter flows are negligible when compared to natural variations in runoff. In dry years, there may be some minor benefits to boating and rafting from having more water in the river in the spring season due to foregone upstream depletions. In wet years, the contribution of natural runoff from the unregulated Colorado River would overwhelm the minor effects of Gunnison River flow changes.

4. The Gunnison River

a. Introduction

The Gunnison River arises in the mountains of Gunnison County, Colorado, and flows westwardly through Montrose and Delta Counties before joining the Colorado River near Grand Junction. The lower portion of the Gunnison River, from its confluence of the Uncompahgre River downstream to the Colorado River, has been proposed as critical habitat for endangered fishes. Three Federal reservoirs, Blue Mesa, Morrow Point and Crystal, partially control flows through the proposed critical habitat reach of the Gunnison River. Two major intervening tributaries, the North Fork of the Gunnison and the Uncompahgre River also affect flows in the reach proposed for critical habitat. The three mainstem reservoirs also have some influence on flows in proposed critical habitat reaches of the Colorado River. Their reoperation to provide flows for endangered fishes may affect economic activity and recreation in the region.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes along the Gunnison River near Grand Junction are depicted in Chapter II-6 (Figure II-6-7) for an average water year. That figure shows that even at maximum release levels from Blue Mesa, Morrow Point and Crystal Reservoirs, it is difficult to achieve the peak spring flows that are biologically recommended for an average water year.

According to the Bureau of Reclamation, 32,500 acre-feet of additional depletions are planned for the Gunnison River between 1993 and the year 2020. Projects accounting for 18,700 acre-feet of those depletions have been through Section 7 Consultations under the Endangered Species Act (see footnote 1 in Section A.1). In the case of the Gunnison River, it is difficult to predict the outcome of future consultations for additional depletions, but given the excess flows available in an average water year, no foregone depletions are expected.

c. Recreation

There are three reaches of the Gunnison River below Morrow Point Reservoir that have different recreational usage characteristics and thus may experience different recreational impacts due to flow alternations for endangered fishes. The Gunnison River within Black Canyon of the Gunnison National Monument provides sightseeing experiences for approximately 300,000 visitors annually from the canyon rim (BCGNM 1993). In addition, the inner gorge experiences about 10,000 activity days of wilderness-type use by hikers, campers, fishermen, and kayakers. Monument officials believe that the overall quality of recreational experiences at the Monument will improve due to flow alterations for endangered fishes because flows will more closely approach the river's natural hydrography. Such changes are expected to enhance sightseeing opportunities from the rim and the value of wilderness experiences in the inner gorge.

Visitation levels at the Monument are not expected to change significantly due to flow changes. Most recreational use of the Monument is non-local and influenced more by general economic and recreational trends than by flow conditions in the river.

The Gunnison River below the monument to its confluence with the North Fork of the Gunnison River provides wilderness-type experiences for private and commercial rafters and fishermen. According to a recent study the by Bureau of Reclamation (1989), this reach of the river provides approximately 4,700 user days of rafting and 17,700 user days of cold water fishing activity annually under without fish flow conditions. Rafting conditions along this stretch of the river are best with flows in excess of 600 cfs. On the other hand, opportunities for anglers on foot are enhanced at flows below 600 cfs.

An analysis of simulated flow patterns for the historical period from 1967 through 1985 indicates that managing reservoirs on the upper Gunnison River for endangered fishes would somewhat diminish rafting opportunities on the Gunnison River below Black Canyon of the Gunnison National Monument because flows of less than 600 cfs would become somewhat more frequent in late summer and early fall. Using formulas from the 1989 Bureau of Reclamation Study, private and commercial rafting opportunities are expected to decrease by 12 to 13 percent due to flow releases for endangered fishes.

On the other hand, opportunities for anglers on foot are expected to increase by about 5 percent due to greater access to the canyon in late summer periods. The combined effect of these changes is that recreational spending in the area is expected to decrease by about $30,000 annually.[39]

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[39] Changes in recreational expenditures due to a resource change are difficult to estimate. Recreational expenditures can shift to substitute sites or other activities within the region without significant impacts on the regional economy. Alternatively, a shift in expenditure patterns to substitute sites or activities out of the region can have significant implications for the regional economy under study. For the Gunnison River, 90 percent of the commercial rafting expenditure decreases and 50 percent of private rafting and fishing expenditure decreases were assumed to shift out of the Colorado economy. A daily expenditure figure of $40.00 was used for private rafting and fishing trips, based upon variable daily expenditure estimates reported by the Colorado Division of Wildlife (1992). A daily expenditure estimate of $175.00 was used for commercial rafting trips, based upon personal

The Gunnison River from the Uncompahgre confluence downstream is an easy stretch of river for canoeing and rafting and receives approximately 6,000 activity days of each use each year (BLMUBRA 1993). Officials of the BLM Uncompahgre Basin Resource Area believe that higher spring flows may discourage family boaters and make float and bank fishing more difficult. The effects on recreational spending in the area could approach a $40,000 reduction annually.[40] The BLM Uncompahgre Basin Resource Area has no plans to construct recreational facilities in critical habitat areas.

Another potential recreational impact of managing the Gunnison River for endangered fishes consists of possible effects upon a heavily utilized cold water fishery at Blue Mesa Reservoir. This reservoir, managed by the Colorado Division of Wildlife (CDOW), receives about 200,000 activity days of use by fishermen on an annual basis. CDOW officials are concerned about the potential effects of large spring releases from the reservoir on stocking and management of rainbow trout and kokonee salmon populations in the reservoir. The effects of such releases will depend on coordination among Bureau of Reclamation, USFWS, and CDOW officials. Under a best-case scenario, no significant impacts to the Blue Mesa fishes may result. Under a worst-case scenario, up to 200,000 activity days of use may be lost. For purposes of this report, a mid-point scenario of 100,000 lost cold-water fishing activity days was assumed. Assuming that 50 percent of variable fishing expenditures would leave the Colorado economy annually as a result of fishery impacts, the annual direct loss to the Colorado economy would be approximately $2.0 million annually.[41]

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interviews with commercial rafting companies in the Upper Basin.

[40] Recreation planners for the BLM Umcompahgre Basin Resource Area believe that recreational use of the Gunnison River downstream from the Uncompahgre confluence could decrease by 33 percent because of flow alterations from upstream reservoirs. The estimated $40,000 decrease in annual recreation expenditures was computed assuming a $40.00 expenditure per activity day and assuming that 50 percent of current expenditures would shift out of the region (see footnote 2, above).

[41] A daily expenditure estimate of $40.00 was used based upon variable expenditure estimates reported by the Colorado Division of Wildlife (1992).

d. Other Impacts

In addition to possible impacts on oil and gas production along the Gunnison River, the possibility exists that large spring reservoir releases may affect some residential structures that have been constructed in the floodplain along the lower Gunnison River. No information concerning the potential magnitude of such impacts is available.

5. The White River

a. Introduction

The White River's headwaters lie in White River National Forest in eastern Rio Blanco and Garfield Counties. The river flows westerly through Rio Blanco County to the Utah State line. The portion of the White River in Colorado from the Utah State line upstream to the Rio Blanco Lake Dam has been proposed as critical habitat for endangered fishes. The White River is not regulated by Federal reservoirs and as a result, no changes in flow regimes have been proposed for this river. A description of other potential impacts attributable to endangered fishes is given below.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes at the White River's Watson gage are depicted in Chapter II-6 for an average water year. As that figure shows, the biological recommendations for endangered fishes in the White River call for more water in the spring during an average year than currently is available. As a result, the USFWS believes that future depletions of White River flows may adversely affect recovery efforts.

According to the Bureau of Reclamation, however, the only depletions projected to occur within the 2020 time frame of this study are associated with the existing Taylor Draw Reservoir in Colorado. Because this reservoir has been permitted and constructed, no impacts upon projected consumptive water uses in the White River basin of Colorado are expected.

The White River does flow through areas of northwestern Colorado containing significant deposits of oil shale. According to Bureau of Reclamation projections, however, no significant depletions of the White River for oil shale development are expected before the year 2040. The recovery horizon for endangered fishes as envisioned by the USFWS occurs before the year 2040. Thus, based upon current projections, there may be no direct conflicts between Colorado synthetic fuels development and recovery of endangered fishes according to current timetables. Although some protection mechanisms may remain in place after recovery of the endangered fishes has been achieved, more latitude with respect to depletions should be available in the projected time frame for development of oil shale resources in the region.

c. Recreation

Because the White River is unregulated by Federal reservoirs, no flow changes are proposed to enhance endangered fish survival and recovery. As a result, no flow effects upon recreational use of the White River in Colorado are anticipated.

Public lands along the critical habitat reach of the White River in Colorado are administered by the BLM White River Resource District. The district supplied no information to the research team concerning any recreational facilities proposed for critical habitat areas along the White River in Colorado.

According to CDOW, there are only approximately 13,000 activity days of warm water angling in northwestern Colorado on an annual basis. Only a very small portion of these occur in Rio Blanco County, and it is thus doubtful that any stocking restrictions on warm water fisheries in the area would have a significant impact upon recreational activity.

6. The Yampa River

a. Introduction

The Yampa River arises in mountainous areas of Routt and Rio Blanco Counties, Colorado, and flows northward through Routt County then westward through Moffatt County to its junction with the Green River in Dinosaur National Monument. The lower sections of the Yampa River from Craig, Colorado (river mile 137.7), downstream to its confluence with the Green River have been proposed as critical habitat for endangered fishes. Although the Yampa River is largely unregulated by storage projects, flow requirements for endangered fishes may affect Colorado's plans to further develop water resources in the area.

b. Consumptive Water Uses

Biological flow recommendations for Colorado's Yampa River at the Deer Lodge gage are depicted in Chapter II-6 for an average water year. As that figure shows, the biological flow recommendation for the Yampa in an average year is approximately the same as those indicated by the river's hydrograph. If the Upper Basin RIP does not show sufficient progress in recovery of fishes in the Yampa drainage, there may be impacts to the regional economy from foregone water development.

According to the Bureau of Reclamation, the State of Colorado anticipates developing approximately 30,000 acre-feet of Yampa River waters for consumptive use within the 2020 time frame of this study. Approximately 3,000 acre-feet of planned depletions are associated with increased municipal and industrial use of water from Stagecoach Reservoir near Steamboat Springs. Another 6,000 acre-feet of planned depletions are for an existing thermal power plant at Craig, Colorado. Both of these planned depletions involve existing permitted facilities that have undergone Section 7 Consultations with the USFWS. As a result, no economic impacts are expected.

The remaining planned depletions along Colorado's Yampa River involve projected use of waters of the Little Snake River, a principal Yampa tributary, for thermal power production and coal gasification. According to the Bureau of Reclamation, the State of Colorado expects to deplete approximately 21,000 acre-feet of Little Snake water annually for these purposes by the year 2020. Although the development of Little Snake waters for coal gasification within the next 27 years is speculative, the potential economic impacts of such development were analyzed as a worst-case scenario.

Because water is more valuable for thermal power production or coal gasification than for agricultural production in the region, the likely effect of foregone future depletions would be the acquisition of agricultural water rights in the basin by power development interests. If coal development occurs along projected timelines, there probably would be agricultural water transfers regardless of the availability of Little Snake waters. Nevertheless, listing and proposed critical habitat designations may effect the timing and magnitude of such transfers. Based upon current cropping patterns and yields in the Little Snake valley, the projected value of agricultural production foregone to energy development interests because of endangered fishes is estimated to be approximately $1.5 million annually by the year 2020.[42]

According to Bureau of Reclamation projections, the State of Colorado also expects additional developments of the Yampa River waters for thermal power production to take place during the period from 2020 to 2040. The recovery horizon for endangered fishes as envisioned by the USFWS extends from the year 2013 to the year 2033. Thus, based upon current projections, there may not be direct conflicts between long-range thermal development and recovery of endangered fishes. Although some protection mechanisms may remain in place after full recovery of the endangered fishes is achieved, more latitude with respect to depletions should be available by the projected 2040 development time frame.

c. Recreation

The Yampa River in Colorado is not regulated by Federal reservoirs, and as a result no changes in flow regime are anticipated to enhance recovery and survival of endangered fishes. As a result, there will be no flow regulating effects upon recreational activity along the Yampa River. To the extent that endangered fish recovery efforts may limit future depletions in the Yampa River, some long-term positive effects upon flow related activities may occur. These effects have not been quantified.

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[42] Agricultural output impacts for the Little Snake Basin were estimated using cropping patterns and yields from a recent study of agricultural production in the Basin by Western Water Consultants (1992). The cropping pattern and yield estimates are based upon the results of a survey of producers conducted during the summer of 1991. Crop prices used in the analysis were averages for the years 1989 through 1991 as reported in the *Agricultural Prices Summary*, published annually by the USDA's National Agricultural Statistics Service. Water requirements for irrigated crops were taken from the *Colorado Irrigation Guide* (1988) and the Western Water Consultants study (1992). A nominal opportunity cost for dryland farming and grazing was deducted from the impact projections.

Public lands along the lower Yampa River proposed critical habitat area in Colorado are managed by the BLM Little Snake Resource Area. The BLM estimates that this portion of the Yampa River receives approximately 92,000 activity days of various types of recreation annually, the major activities being camping, picnicking, sightseeing, canoeing and rafting (BLMLSRA 1993). The resource district has plans for additional boat ramps and parking areas along proposed critical habitat stretches to handle increased public demand for recreation in the area. Location of these facilities may be affected by the proposed critical habitat designation.

7. The San Juan River

a. Introduction

The San Juan River and its major tributaries, the Animas and LaPlata rivers, arise in the mountainous areas of Mineral, Archuleta and LaPlata counties in southwestern Colorado. Although no sections of these rivers have been proposed as critical habitat for endangered fishes, areas along the lower San Juan River in New Mexico and Utah have. For this reason, flow recommendations for endangered fishes in the lower San Juan River may have implications for water developing in the headwaters of the San Juan drainage in Colorado.

b. Consumptive Water Uses

Biological flow recommendations for the San Juan River near Shiprock, New Mexico, are depicted in Chapter II-6 for an average water year. Figure II-6-10 shows that there is insufficient water in the river to meet peak flow requirements for endangered fishes during the months of May and June. The situation is exacerbated in a dry year. In a dry year, flows in the river fall far short of the biological needs of endangered fishes. As a result, the USFWS believes that future depletions of the San Juan River above proposed critical habitat reaches must be minimized.

According to Bureau of Reclamation projections, planned depletions of the San Juan watershed in Colorado during the period from 1993 through 2020 total 56,000 acre-feet annually. These depletions are associated with the Animas-LaPlata project, designed to provide irrigation, municipal, and industrial water to Indian and non-Indian water users in southwestern Colorado. The USFWS has issued a biological opinion which would allow the project to deplete up to 57,100 acre-feet of water annually. That level of depletion is approximately 98,000 acre-feet less than originally proposed for Phase I of the project. A determination of whether the additional 98,000 acre-feet of depletions associated with Phase I will be permitted will be made at the conclusion of a 7-year study that is currently underway to assess flow requirements for endangered fishes in the San Juan Basin. This draft economic analysis does not assess the potential economic effects that would result from limiting Phase I of the project to 57,100 acre-feet of depletions.

Succeeding phases of the Animas-LaPlata project are projected to be operational in the year 2030 and beyond. Through implementation of the San Juan RIP, or by other means if that program is unsuccessful, the USFWS expects to achieve recovery of endangered fishes in the San Juan Basin before the year 2030. Thus, there may not be conflicts between later phases of the Animas-LaPlata project and the recovery of endangered fishes. Although some protection mechanisms may remain in place after the fishes have been recovered, additional latitude with respect to depletions may exist when healthy fish populations have been established.

c. Recreation

The San Juan River and its tributaries in Colorado are not regulated by large Federal reservoirs and have not been proposed as critical habitat reaches. As a result, no recreational impacts are expected other than those associated with the introduction of nonnative fishes. The USFWS believes that future stocking of nonnative warm water fishes in the Gunnison and San Juan drainages of Colorado may prove detrimental to endangered fishes. No information is available concerning the breakdown of warm water fishing opportunities in southwestern Colorado. Nevertheless, the CDOW believes that with stocking restrictions, up to 50,000 activity days of warm water angling might be lost annually in the two basins. Assuming that 50 percent of variable recreational spending associated with warm water fishing in the area is lost to other States, the direct impact on Colorado's economy would be approximately $1.0 million annually.[43]

8. Overall Impacts

The overall direct impacts of critical habitat designations on the Colorado economy are obtained by summing the values for the individual river basins as discussed above. The Statewide electric power impacts are added to these. The overall direct impacts are reported in Table II-9-CO-1.

Table II-9-CO-1. Direct Impacts for Colorado
(Millions of 1982$)

	Period					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	-2.297	-4.595	-8.116	-8.570	-10.337	-13.207
Other Crops	-0.630	-1.261	-1.735	-2.213	-2.716	-3.200
Recreation	-1.535	-3.070	-3.070	-3.070	-3.070	-3.070
Electric Power	-1.981	-3.588	-8.192	-4.179	-7.577	-0.663
Non Petroleum Mining	1.309	1.979	3.105	1.378	1.607	1.413
Oil and Gas Mining	2.497	0.252	0.691	1.493	7.543	0.944
Construction	6.35	6.35	-6.35	6.35	6.35	6.35
Combined Mfg.	6.35	6.35	6.35	6.35	6.35	6.35
TOTAL DIRECT IMPACTS	10.06	2.42	-4.62	-2.461	-1.85	-3.76

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[43] The $1.0 million annual loss in direct expenditures is based upon the assumption that 25,000 activity days of warm water angling expenditures will be lost to the Colorado economy. The loss was valued at $40.00 per activity day based upon variable fishing expenditure estimates reported by the Colorado Division of Wildlife (1992).

C. New Mexico

1. Introduction

The San Juan River from Farmington, New Mexico, downstream to the State line is the only river segment in New Mexico that has been proposed as critical habitat for endangered fishes. The critical habitat designation and the recovery efforts for endangered fishes in the lower San Juan Basin could affect the regional economy of northwestern New Mexico. Southwestern New Mexico also contains the headwaters of the Gila River. Although reaches of the Gila River in Arizona have been proposed as critical habitat, no impacts are expected to accrue to the New Mexico economy from such designations.

New Mexico electric power users may also be affected by changes in hydroelectric generation that result from managing out-of-State facilities to enhance flows for endangered fishes. Projections of hydroelectric impacts on the New Mexico economy are discussed in Section 2 below. Succeeding sections discuss the potential regional economic impacts of recovery efforts for endangered fishes in New Mexico's San Juan River Basin.

2. Electric Power Impacts

The output at the Navajo Dam is projected to be affected by endangered fishes considerations. The result will be reduced electric power to the city of Farmington and the surrounding area. At this time, estimates are available for the losses of electric power but no projections are currently available for the sources of the replacement power. The losses from the hydroelectric generation are incorporated into the projections employed in Chapter II-11 and are reported in Table II-9-NM-1 at the end of this section.

3. Consumptive Water Uses

Biological flow recommendations for the San Juan River near Shiprock, New Mexico, are depicted in Chapter II-6. The figures show that there is insufficient water in the river to meet peak flow requirements for endangered fishes during the months of May and June in an average water year. This situation is exacerbated in a dry year, when river flows fall far short of the biological needs of endangered fishes. As a result, the USFWS believes that further depletions of the San Juan River in New Mexico must be minimized.

According to the Bureau of Reclamation, depletions of the San Juan River in New Mexico are expected to increase by approximately 242,000 acre-feet during the period from 1993 through 2020 in the absence of recovery efforts for endangered fishes. Approximately 84,000 acre-feet of those depletions would come from projects that have undergone Section 7 Consultations with the USFWS under the auspices of the Endangered Species Act. These depletions may be unaffected by recovery efforts for endangered fishes (see footnote 1 in Section A.1). The remaining 158,000 acre-feet of depletions, however, may be foregone unless sufficient progress occurs in recovering endangered fishes under the San Juan RIP.

Approximately 133,000 acre-feet of the projected depletions are for the Navajo Indian Irrigation Project (NIIP) near Farmington, New Mexico. That project was authorized by Congress in 1962 to provide irrigation water to approximately 110,000 acres of Navajo-owned land in northwest New Mexico. The project was designed as 11 large blocks of irrigated acreage, ranging in size from 8,000 to 10,000 acres each. As of 1990, a total of six blocks of land totaling 54,500 acres had been brought under irrigation (USFWS 1993). Net depletions of the San Juan River from the project average about 133,000 acre-feet annually.

The NIIP has had a troubled financial history, and the timetable for its eventual completion remains uncertain. If completion of the project is foregone or delayed due to recovery efforts for endangered fishes, however, there will be direct impacts to the Navajo Nation and the New Mexico economy. Based upon estimated cropping patterns and yields for the project area, the value of foregone production from the NIIP could be $19.1 million annually by 2020.[44]

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[44] Agricultural output impacts for the San Juan Basin in New Mexico were estimated from cropping patterns, yields, crop prices, and water requirements for crops in San Juan County. Cropping patterns were derived from the U.S. Census of Agriculture for the years 1982 and 1987. Yields and crop prices were derived from various

The remaining 25,000 acre-feet of foregone depletions not associated with the NIIP would also impact regional economic output in the agricultural sector. Those additional impacts could total $3.6 million in foregone agricultural output on an annual basis by the year 2020.[45]

4. Recreation

The San Juan River below Navajo Reservoir is a premier tailwater trout fishery site of national importance. The river immediately below the reservoir is managed as a State park and hosts approximately 70,000 visitors annually (NLSP 1993). Over 80 percent of the park's visitors come to fish for trout, primarily rainbows, that have flourished in the river since the construction of Navajo Reservoir. According to the BLM Farmington Resource Area, another 12,000 activity days of angling occur along the Federally managed stretches of the San Juan River below Navajo State Park (BLMFRA, 1993).

According to State and Federal resource managers, flow alterations in the San Juan River to accommodate endangered fishes have not and should not negatively impact the tailwater fishery below Navajo Dam. Although high spring flows tend to reduce angling usage and catch-rates, resource managers believe they provide fish populations with a needed break from the heavy pressure they receive during low flow periods. Furthermore, high spring flows have aided in the recruitment of cottonwood seedlings along the river, which will eventually lead to more shade and the potential for improved trout habitat. Protection efforts for endangered fishes may also have long-term benefits to the tailwater fishery below Navajo Dam by ensuring careful review of upstream depletions. Currently, there are no legal flow protections in place for this fishery.

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documents published by the USDA's National Agricultural Statistics Service. Water requirements for irrigated crops were assumed to be the same as for the 54,000 acres currently under irrigation on the NIIP. A nominal opportunity cost for dryland farming and grazing was deducted from the impact projections.

[45] Non-NIIP agricultural output impacts were estimated using the same data and approach used for NIIP impacts (see footnote 7).

Some seasonal shifts in angler usage of the San Juan River has occurred and will continue occur because some anglers will avoid the river during peak release periods, thus increasing utilization during the low-flow periods of late summer and fall. Overall, however, no significant changes in angling activity are expected along New Mexico's San Juan due to recovery efforts for endangered fishes. At some future point, congestion may limit the quality and quantity of angling activity along the river during low-flow periods. These potential impacts have not been quantified.

The lower San Juan River in New Mexico receives only limited boating and rafting usage. Most of the boating activity below Navajo Dam is associated with commercial guide services for trout fishermen. This type of boating activity may increase during high flow periods when the river is less wadable. The river below Navajo State Park receives limited usage by rafts, canoes, and kayaks. BLM resource managers believe that boating use of the river may increase because of high spring releases for endangered fishes (BLMFRA 1993).

To accommodate future recreational needs, the BLM Farmington Resource Area is planning a 320-acre unstaffed nature center and boating access point along the San Juan River below Farmington. The center would be located in an area proposed for critical habitat and may be affected by recovery efforts for endangered fishes.

5. Other Impacts

The BLM Farmington Resource Area believes that recovery efforts for endangered fishes will affect archeological and sociological resources along the San Juan River. Impacts on archeological sites are expected to be positive to the extent that floodplain activities such as oil, gas, or gravel operations that might adversely affect archeological sites, will be more closely monitored. From a sociological perspective, the Resource Area believes that additional habitat protection requirements imposed by critical habitat designations will increase the potential for conflicts between resource managers and resource users.

6. Overall Impacts

The overall direct impacts to the New Mexico economy for each of the modeling years are summarized in Table II-9-NM-1.

Table II-9-NM-1. Direct Impacts for New Mexico
Millions of 1982$

	Period					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	-1.433	-2.866	-7.451	-11.033	-17.052	-22.640
Electric Power	-0.293	-0.314	-0.307	-0.299	-0.295	-0.326
TOTAL DIRECT IMPACTS	-1.726	-3.180	-7.758	-11.332	-17.347	-22.966

D. Utah

1. Introduction

The State of Utah contains three major rivers of importance to endangered fishes: the Colorado, the Green, and the San Juan. Virtually all of the free flowing stretches of these rivers in Utah have been proposed as critical habitat for endangered fishes. In addition, the USFWS has proposed designating a small portion of the lower Duchesne River as critical habitat. The Duchesne is a tributary of the Green River. The White River, another Green River tributary, also has been proposed as critical habitat from the Colorado State line to its confluence with the Green. These proposals and ongoing recovery efforts for endangered fishes may affect economic activity in the regional economy.

Utah electric power users will be affected by changes in hydroelectric generation that results from managing Federal reservoirs in the Colorado River Basin to enhance flows for endangered fishes. Projections of electric power impacts are available only at the State level and are discussed in Section 2, below. Succeeding sections discuss other impacts attributable to endangered fish recovery efforts as they may affect specific river basins.

2. Electric Power Impacts

Utah is projected to face a decline in hydroelectric power through the study period. This will partly be offset with increases in gas and coal production that is used to generate thermal power to replace the lost hydro. The impacts range from $0.21 millions in 1995 to $1.184 millions in 2020 (1982$). No capacity expansion is projected for Utah to increase the production of thermal electric power.

3. The Colorado River

a. Introduction

The Colorado River from the Colorado State line near Westwater Canyon to Lake Powell has been proposed as critical habitat for endangered fishes. The potential economic impacts of recovering endangered fishes in this stretch of river are discussed below.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes in the Colorado River at the Colorado-Utah State line and downstream at Cisco, Utah, are depicted in Chapter II-6 for an average water year. As those figures show, actual peak flows at these gauges are significantly below the biological recommendations for an average water year. Furthermore, there are no major Federal reservoirs upstream on the mainstem Colorado River that can be reoperated to the benefit of endangered fishes. The only reservoir operational changes for endangered fishes that will affect the Colorado River in Utah are from the Crystal, Morrow Point and Blue Mesa reservoirs on the Gunnison River above Montrose, Colorado. These reservoirs, however, have only a small influence on Colorado River flows in Utah.

Unless sufficient progress is made in recovering endangered fishes in the Upper Basin RIP, future depletions of the Colorado River in Utah may be foregone. According to the Bureau of Reclamation, depletions of the Colorado River in Utah above Lake Powell are expected to increase by approximately 12,000 acre-feet annually between 1993 and 2020. No information concerning the nature of these depletions or likely impacts if they are foregone is available for this draft report.

c. Recreation

The Colorado River from the Colorado-Utah State line downstream to Lake Powell is heavily utilized by private and commercial recreational rafters and boaters. Although precise usage statistics are not available, data from recreational resource managers in the area indicate that this stretch of the Colorado River receives approximately 150,000 activity days of rafting and boating use annually. Approximately one-third of this use is upstream from Moab, Utah, and includes the popular Westwater Canyon stretch of rapids. The remaining two-thirds is downstream from Moab to Lake Powell, including the Cataract Canyon stretch between the Colorado-Green River confluence downstream to Lake Powell.[46]

Interviews conducted with commercial rafting companies in the Moab, Utah, area revealed concerns about how changing patterns of reservoir releases for endangered fishes might affect rafting opportunities along the Colorado River in Utah. In particular, commercial rafters were concerned that higher spring peak flows might make some rapids more dangerous than at present, while lower late season flows might also cause safety problems due to exposed rocks and fail to provide the quality white-water experience their clients expect.

For the Westwater Canyon stretch of the river, commercial rafters indicated that flows in excess of 20,000 cfs can cause safety problems. On the other hand, flows below 3,000 cfs can provide diminished white-water experiences and/or safety problems due to exposed rocks. Flow changes due to endangered fishes in the Westwater Canyon reach are expected to be minimal, however, due to the lack of Federal reservoirs upstream on the mainstem Colorado River. The flow effects that will occur are due to the reoperation of reservoirs on the Gunnison River to meet biological flow recommendations on the lower reaches of that river.

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[46] Estimates of recreational use for the Colorado River in Utah were based upon the results of a mail survey of resource managers in the area, personal interviews with commercial rafting companies, and a variety of published reports, some of which provided overlapping and conflicting information. The estimate of 150,000 activity days is the authors' estimate based upon information from all of the above sources.

The results of a simulation study of flow changes for endangered fishes on rafting opportunities at Westwater Canyon are presented in Table II-9-UT-1.[47] The results in that table show that under current levels of upstream depletions, rafting opportunities would be slightly diminished in the early season (7 percent) due to a small increase in the frequency with which flows would exceed 20,000 cfs. Lake season rafting opportunities would also decrease slightly (4 percent) due to an increase in the frequency of flows under 3,000 cfs.

Table II-9-UT-1. Effects of Flow Changes on Colorado River Rafting Conditions at Westwater Canyon (May through October)

	Percentage of Acceptable Conditions		
Scenario	**Without Fish**	**With Fish**	**Net Change**
Current Depletions (1993)			
May - July	74%	67%	-7%
August - October	79%	75%	-4%
Future Depletions (2020)			
May - July	68%	67%	-1%
August - October	75%	75%	0%

Source: Bureau of Reclamation hydrologic simulations of water years 1967 through 1985.

In the long run, however, these changes would be offset by the fact that some upstream depletions may be foregone to ensure the survival and recovery of endangered fishes. Under depletion scenarios for the year 2020, there is virtually no difference in the percentage of acceptable rafting conditions between the with fish and without fish scenarios. Given the minor nature of short-run impacts and lack of long-run impacts, no significant changes in recreational opportunities are expected due to recovery efforts for endangered fishes.

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[47] The simulation study was conducted using the Bureau of Reclamation's CRSS hydrologic model of the Upper Basin. The model was run for water years 1967 through 1985 under the assumption that no federal reservoirs in the Upper Basin were making flow releases for endangered fishes prior to 1986. The model was then rerun for the same water years in an attempt to achieve biological flow recommendations for endangered fishes by altering release patterns from Flaming Gorge, Blue Mesa, Morrow Point, Crystal, and Navajo reservoirs. Two additional model runs were then made using the same set of assumptions but deducting depletions that have occurred or are expected to occur between the year 1985 and the year 2020. Frequency tabulations were then prepared of average monthly flows in the Colorado River at the Colorado-Utah State line, and the percentage of months was computed during which average flows fell in the range of 3,000 to 20,000 cfs.

A similar study was undertaken on the effects of flow changes on rafting opportunities in the Cataract Canyon stretch of the Colorado River downstream from the confluence of the Green and Colorado Rivers.[48] The results of that study are presented in Table II-9-UT-2. Rafting opportunities along this stretch of river may be diminished due to safety problems at flows in excess of 40,000 cfs and below 5,000 cfs.

Table II-9-UT-2. Effects of Flow Changes on Colorado River Rafting Conditions at Cataract Canyon (May through October)

	Percentage of Acceptable Conditions		
Scenario	**Without Fish**	**With Fish**	**Net Change**
Current Depletions (1993)			
May - July	72%	61%	-11%
August - October	91%	77%	-14%
Future Depletions (2020)			
May - July	77%	N/A	N/A
August - October	82%	N/A	N/A

Source: Bureau of Reclamation hydrologic simulations of water years 1967 through 1985.

The results in Table II-9-UT-2 indicate that there would be greater impacts upon rafting opportunities at Cataract Canyon than at Westwater Canyon due to flow releases for endangered fishes. The reason is that Cataract Canyon flows are influenced by flow changes in both the Green and Colorado Rivers. The results in Figure II-6-11 indicate that flow changes for endangered fishes would decrease rafting opportunities by 11 percent in the early season and by 14 percent in the late season for current depletion levels. Simulation study results for future depletion levels and fish releases are not available for this draft report. The overall effect may be to reduce rafting opportunities along this stretch of the Colorado River by approximately 12,000 activity days annually. Some of this activity may shift to other times of the year or other stretches of river in the local area. Based upon interviews with commercial rafters in the area, however, there is a possibility that a substantial amount of the activity loss might shift to other river systems such as the Salmon River in Idaho. Assuming that 8,000 of the 12,000 activity day loss would shift out of the region, and assuming an average expenditure loss of $150 per activity day, the local direct economic impacts could approximate $1.2 million annually.[49]

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[48] The simulation study for Cataract Canyon was based upon the CRSS model runs described in footnote 10, using a 5,000 to 40,000 cfs acceptability criterion.

4. The Green River

a. Introduction

The Green River in Utah flows westerly out of Flaming Gorge Reservoir to the Colorado State line and then flows southward to its confluence with the Yampa River in Dinosaur National Monument. It joins the Colorado River in Canyonlands National Park upstream from Lake Powell and the Cataract Canyon stretch of the Colorado River. The stretch of the Green River from its confluence with the Yampa River downstream to its confluence with the Colorado River has been proposed as critical habitat for endangered fishes.

The flows of the Green River in Utah are controlled by Flaming Gorge Reservoir. As a result of a USFWS biological opinion concerning operation of the reservoir, flows from Flaming Gorge have been altered in recent years to enhance reproduction and survival of endangered fishes in the Green River. The effects of these flow alternations on economic activity along the Green River in Colorado and Utah are discussed below.

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[49] Interviews with commercial rafting companies in the Moab, Utah, area indicate that expenditures on commercial trips average approximately $175.00 per activity day. This figure was reduced to $150.00 to account for a somewhat lower expenditure level for non-commercial trips.

b. Consumptive Water Uses

According to the Bureau of Reclamation projections, depletions along the mainstem of the Green River in Utah above Lake Powell are expected to increase by approximately 44,000 acre-feet between the years 1993 and 2020. These planned depletions include approximately 16,000 acre-feet for thermal power production, 10,000 acre-feet for agricultural uses on the Uintah and Ouray Indian Reservation, and 18,000 acre-feet for other agricultural, municipal, and industrial uses.

Biological flow recommendations for endangered fishes in the Green River below Flaming Gorge Reservoir are described in Chapter II-6. As discussed there, the USFWS's flow recommendations call for significantly less water, primarily during winter months, than is currently released from Flaming Gorge Reservoir in most years. As a result, planned depletions of the Green River in Utah below Flaming Gorge should not adversely affect endangered fish survival and recovery if timed in such a way as to not affect spring peak flows.

c. Recreation

The Green River corridor below Flaming Gorge Reservoir is one of the nation's premier tailwater trout fisheries and provides approximately 120,000 activity days of angling each year (IHE 1991). The level of activity may be reduced in the future, however, the U.S. Forest Service is implementing a permit system for both anglers and rafters. According to the Utah Division of Wildlife Resources (UDWR), changes in release patterns from Flaming Gorge in recent years to enhance endangered fish reproduction and survival have affected angling success in spring months. The reason is that higher spring releases for endangered fishes keep trout populations less concentrated and provide more of a challenge to fishermen inexperienced in fishing the higher flows. UDWR expects success rates to increase as fishermen learn to fish the river at higher flow levels in the spring. No long-term negative effects on trout populations are expected; however, water temperature stemming from lower summer flows are being investigated.

Below the corridor stretch, the Green River flows southward into Dinosaur National Monument, where it is joined by the Yampa River. Rafting is popular on the Green River through Dinosaur National Monument, although facilities are primitive and recreational usage is dispersed through a strict permitting system. Dinosaur National Monument officials believe that altered flow releases from Flaming Gorge have increased and will continue to increase the quality of early season rafting trips and to decrease the quality of late season trips (Dinosaur National Monument, 1993). Demand for rafting permits is high throughout the season, however, and they expect no changes in visitation due to flow alterations. Rafting activity currently stands at about 21,000 activity days annually under permit restrictions. The only recreational usage impact anticipated at the Monument is a shift toward smaller boats for late season trips.

From Dinosaur National Monument, the Green River flows southwesterly and southerly to its confluence with the Colorado River in Canyonlands National Park. Desolation and Labyrinth Canyons are popular rafting areas along this stretch of the Green River and receive approximately 56,000 activity days of combined use on an annual basis (BLM 1993). Bureau of Land Management resource managers for these areas do not anticipate any overall changes in rafting activity due to operational changes for endangered fishes at Flaming Gorge (BLMSRRA 1993; BLMPRRA 1993).

Commercial outfitters in Moab, Utah, however, are concerned that lower late season flows in Desolation and Labyrinth Canyons will diminish the quality of rafting experiences and negatively impact their business. They believe that flows below 3,000 cfs along this stretch of river result in unacceptably long trips and can cause safety problems. The results of a simulation study of flow changes on rafting conditions along the lower Green River are given in Table II-9-UT-3.[50] The data indicate that although fish releases from Flaming Gorge would slightly improve early season rafting conditions, late season acceptable conditions could drop by 25 to 30 percent.

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[50] The simulation study for the lower Green River was based upon the CRSS model runs described in footnote 10, using an acceptability criterion of above 3,000 cfs.

Even without fish releases from Flaming Gorge, late season flows in the lower Green River are often inadequate for floating. As a result, less rafting activity takes place along the lower Green during the fall. Nevertheless, the overall affect of managing Green River flows for endangered fishes could be to reduce late season rafting opportunities by approximately 9,000 activity days annually. Some of this activity may shift to other times of the year or other stretches of river in the local area. It is possible, however, that a substantial amount of the activity loss might shift to other river systems such as the Salmon River in Idaho. Assuming that 6,000 of the 9,000 activity day loss would shift out of the region, and assuming an average expenditure loss of $150 per activity day, the local direct economic impacts could approximate $900,000 annually.[51]

Table II-9-UT-3. Effects of Flow Changes on Green River Rafting Conditions (May through October)

	Percentage of Acceptable Conditions		
Scenario	**Without Fish**	**With Fish**	**Net Change**
Current Depletions (1993)			
May - July	95%	96%	+1%
August - October	56%	28%	-28%
Future Depletions (2020)			
May - July	93%	95%	+2%
August - October	51%	25%	-26%

Source: Bureau of Reclamation hydrologic simulations of water years 1967 through 1985.

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[51] See footnote 12.

The BLM Price River Resource Area has plans to construct and/or extend two boat ramps and a picnic area campground in proposed critical habitat areas along the Green River. The location and/or cost of these facilities may be affected to an unknown extent by the proposed critical habitat designations.

5. The Duchesne River

The Duchesne River arises in the Uinta Mountains of Duchesne County, Utah, and flows southwesterly to its confluence with the Green River near Ouray, in Uintah County. The lower 2.5 miles of the Duchesne River have been proposed as critical habitat for endangered fishes. Very little information is available on flow needs of endangered fishes in the lower portion of the Duchesne River. During above normal runoff years, however, razorback sucker and Colorado squawfish are abundant in the lower reaches of the river. Under current depletion levels, the lower portion of the Duchesne could be completely dewatered. Because of this possibility, even maintaining what water remains in the Duchesne River may be insufficient to meet the needs of the fishes. Current studies on the river will result in preliminary flow recommendations in January 1994. These studies will focus on what life history requirements the Duchesne River is currently providing or could potentially provide. Seasonal flow recommendations will be made based on this information. If time permits, these flow recommendations will be analyzed and the impacts of providing fish flows will be incorporated into the economic analysis prior to finalizing the designation of critical habitat.

Warm water lake impacts may potentially occur in the Duchesne River drainage. These impacts were investigated through the stocking survey that was conducted with the UDWR. The reservoirs where these impacts are predominately likely to occur and which represent most of the warm water fishing are Cottonwood, Bullock, Pelican Lake, Red Fleet and Steinaker. No anticipated impacts are anticipated for Starvation and Strawberry reservoirs. The worse-case scenario, whereby stocking of warm water fish would be curtailed, would result in an average loss of 75 percent of current warm water angler days. This represents

19,752 angler days annually. Assuming that all of the anglers substitute out-of-State sites, the direct impact on recreational expenditures could be $790,000 annually.[52]

6. The White River

a. Introduction

The White River flows westerly out of Colorado into Uintah County, Utah, where it joins the Green River near Ouray. This stretch of river has been proposed as critical habitat for endangered fishes. There are no large Federal reservoirs regulating the White River, so there will be no changes in the river's flow regime to accommodate endangered fishes. Other potential economic impacts of recovering endangered fishes in the White River are discussed below.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes in the White River are depicted in Figure II-6-4. As discussed in that section of the report, the USFWS believes that additional depletions of flows in the lower White River may adversely affect recovery efforts for endangered fishes unless sufficient recovery progress is achieved under the Upper Basin RIP. As a result, planned depletions of the White River in Utah that have not undergone Section 7 Consultations under the Endangered Species Act may be delayed until after the recovery horizon envisioned for the years 2013 to 2033.

According to the Bureau of Reclamation, projected depletions of the White River in Utah during the period from 1993 to 2020 include 24,000 acre-feet from a proposed White River Dam and Reservoir, which would be used primarily to irrigate agriculture on the Uintah and Ouray Indian Reservation. There are questions concerning the economic feasibility of this project, but if this water is foregone to enhance recovery efforts for endangered fishes, there would be negative impacts on the reservation and the surrounding regional economy. Based upon current production practices, cropping patterns and yields for irrigated agriculture in Uinta County, the foregone production loss would be approximately $919,000 annually by the year 2020.[53]

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[52] The $40.00 per activity day variable expenditure rate for warm water fishing used in the analysis is the same as that used in the Colorado analysis (see footnote 6).

There is also a possibility that White River waters might eventually be used to develop oil shale energy resources in the future. According to Bureau of Reclamation projections, however, no depletions of the White River for oil shale development in Utah are expected before the year 2030. The recovery horizon for endangered fishes as envisioned by the USFWS extends from the year 2003 through the year 2033. Thus, based upon current projections, there may be no direct conflicts between Utah synthetic fuels development and recovery of endangered fishes according to current timetables. Although some protection mechanisms may remain in place after recovery of the endangered fishes has been achieved, more latitude with respect to depletions should be available in the projected time frame for development of oil shale resources in the region.

c. Recreation

Because the White River is unregulated by Federal reservoirs, no flow changes are proposed to enhance endangered fish survival and recovery. As a result, no flow effects upon recreational use of the White River in Utah are anticipated. There are also no known plans to construct recreational facilities in critical habitat areas along the river.

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[53] Agricultural output impacts for the White River Basin were estimated from cropping patterns, yields, crop prices, and water requirements for crops in Uintah County, Utah. Cropping patterns were derived from the U.S. Census of Agriculture for 1982 and 1987. Yields were estimated from data reported in *Utah Agricultural Statistics*, reported by the Utah Agricultural Statistics Service, for the years 1989 through 1991. Crop prices were taken from the *Agricultural Prices Summary*, published by the National Agricultural Statistics Service, for the years 1989 through 1991. Water requirements for irrigated crops were based upon information in the *Utah Irrigation Guide*, published by the U.S. Department of Agriculture (1984). A nominal opportunity cost for dryland farming and grazing was deducted from the impact projections.

7. The San Juan River

a. Introduction

The San Juan River flows into the extreme southeastern corner of Utah near the four corners area and flows northerly and then westerly into Lake Powell. This stretch of the San Juan River has been proposed as critical habitat for endangered fishes. An assessment of the potential economic impacts of endangered fish recovery efforts along this stretch of river is given below.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes in the lower San Juan River are discussed elsewhere in this report. At the present time, Utah depletions of the lower San Juan River total approximately 13,000 acre-feet annually (Bureau of Reclamation 1993). Most of this water is used for irrigation, with a small amount devoted to municipal and industrial use. According to the Bureau of Reclamation, there are no plans to further deplete the San Juan River between the Utah State line and Lake Powell. As a result, there should be no economic impacts on consumptive water uses in Utah from recovery efforts for endangered fishes.

c. Recreation

The San Juan River from Bluff, Utah, downstream to Lake Powell has become increasingly popular for rafting in recent years. According to the BLM San Juan resource area, this stretch of river receives approximately 60,000 activity days of rafting use annually (including kayaks and canoes). Alterations in releases from Navajo Reservoir upstream in New Mexico to enhance the recovery of endangered fishes have and will continue to have some impacts upon rafting opportunities along the lower San Juan River. These impacts are somewhat muted, however, by large tributary inflows between Navajo Reservoir and the lower river.

BLM resource managers for the San Juan River believe that higher spring releases from Navajo Reservoir will enhance the quality of rafting opportunities through mid-July in most years. This improvement will have little effect upon usage of the river in May and June because the BLM limits the number of people on the river and because May and June launch dates are usually filled regardless of water conditions. The BLM expects increased usage of the river in April and early July due to fish releases, however, a somewhat decreased use in the late summer and fall. Overall, it expects no significant change in river utilization due to endangered fishes.

Commercial outfitters using the San Juan River are concerned about losing late season business if flows routinely fall below 500 cfs. A hydrologic simulation study performed by the Bureau of Reclamation, however, indicates that without fish releases, late season flows would fall below 500 cfs 4 percent of the time on a monthly basis.[54] With fish releases, the comparable figure is 5 percent. As a result, no significant changes in late season river utilization are expected.

The BLM San Juan Resource area does have plans to construct a boat ramp at Mexican Hat and to expand a campground at Sand Island, both of which may impinge upon critical habitat. It is unknown whether these facilities would adversely modify essential elements of the habitat.

8. Overall Impacts

The total impacts for Utah are obtained by summing the impacts that are projected to occur in the river basins and reaches as discussed above. These are presented in Table II-9-UT-4.

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[54] The simulation study for the lower San Juan River was based upon the CRSS model runs described in footnote 10, using an acceptability criterion of above 500 cfs.

Table II-9-UT-4. Direct Impacts for Utah
Millions of 1982$

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	0.0	-0.191	-0.421	-0.842	-0.881	-0.919
Recreation	-2.890	-2.890	-2.890	-2.890	-2.890	-2.890
Electric Power	-0.210	-0.140	-0.312	-0.564	-0.925	-1.184
Non-petroleum Mining	+0.932	+1.355	+1.404	+1.250	+1.260	+1.358
TOTAL DIRECT IMPACTS	-2.168	-1.866	-2.219	-3.046	-3.436	-3.635

E. Wyoming

1. Introduction

Wyoming contains two significant Colorado River tributaries: the Green and Little Snake Rivers. No sections of these rivers in Wyoming have been proposed as critical habitat for endangered fishes. Nevertheless, flow requirements for endangered fishes in the Yampa and Green Rivers in Colorado and Utah were reviewed to assess their effects on Wyoming's ability to develop water in its Green and Little Snake drainages. Wyoming electric power users may also be affected by changes in hydroelectric generation that result from managing Federal reservoirs in the basin to enhance flows for endangered fishes. Projections of electric power impacts are only available at the State level. Succeeding sections discuss other impacts attributable to proposed critical habitat designations as they affect Wyoming's Green and Little Snake drainages.

2. Electric Power Impacts

There are no electric power impacts projected for Wyoming. The State economy is projected to receive a peripheral impact in the form of increased demand for coal production. This occurs beginning in 2005 and coincides with the addition of thermal capacity elsewhere in the region. This impact ranges from a positive $0.046 millions in 2005 to a positive $0.102 millions in 2015 (1982$).

3. The Green River Basin

a. Introduction

The Green River arises in Wyoming's Wind River Mountains in Sublette County and flows southerly through Lincoln and Sweetwater Counties before entering Flaming Gorge Reservoir above the Wyoming-Utah State line. Fontanelle Reservoir, operated by the Bureau of Reclamation, controls flows in the river between the northwestern corner of Sweetwater County and Flaming Gorge Reservoir.

b. Consumptive Water Uses

Proposed critical habitat reaches along the Green River in Utah should not hinder Wyoming's ability to develop and utilize its water resources in the Green River Basin. The biological flow recommendations for proposed critical habitat stretches along the Green River in Colorado and Utah call for less water than is currently released from Flaming Gorge Reservoir on an annual basis. As a result, a considerable amount of Green River water could be developed in Wyoming without adversely affecting proposed critical habitat along the lower Green River. Over the 19-year period from 1967 through 1985, Green River flows at Jensen, Utah, averaged 3,285,000 acre-feet annually. The USFWS's biological flow recommendations, when applied to the same hydrologic data, call for flows averaging only 2,635,000 acre-feet on an annual basis.

According to Bureau of Reclamation projections, consumptive water use in Wyoming's Green River Basin will increase from 281,000 acre-feet in 1993 to 363,000 acre-feet by the year 2020. Most of this projected increase is associated with the development of coal, oil shale, and mineral resources in Sweetwater County, using currently unutilized storage in Fontanelle Reservoir. These developments should not be affected by proposed critical habitat designations on the lower Green River.

c. Recreation

Proposed critical habitat reaches on the Green River in Colorado and Utah should have minimal impacts upon recreational usage of the Green River in Wyoming. No operation changes in Fontanelle Reservoir operations would occur because of proposed critical habitat designations, so recreational usage of the Green River above Flaming Gorge Reservoir would be unaffected.

Flaming Gorge Reservoir is a heavily used recreational resource in southwestern Wyoming that has been operated to enhance flows for endangered fishes in the lower Green River since 1986. These operational charges involve higher releases in spring and lower releases in late summer than had been the case prior to 1986. As a result, the reservoir fills somewhat more slowly in the spring and remains at slightly higher elevations later into the summer and fall seasons. These minor changes have not significantly affected the recreational use of the reservoir, including its fishery. On an average annual basis, the storage amounts in the reservoir have not changed due to endangered fishes.

d. Other Impacts

Because no critical habitat has been proposed for the Green River in Wyoming, no other economic impacts are expected.

4. The Little Snake River Basin

a. Introduction

The Little Snake River arises in the mountains of northern Colorado, flows northwesterly across the State line into Carbon County, Wyoming, and then flows westerly and southwesterly until it joins the Yampa River near Deer Lodge, Colorado, just east of Dinosaur National Monument. Although no reaches of the Little Snake River in Wyoming have been proposed as critical habitat, flow requirements for endangered fishes in the Yampa River in Colorado may affect potential water development projects in Wyoming's Little Snake Basin.

b. Consumptive Water Uses

Biological flow recommendations for endangered fishes in Colorado's Yampa River are depicted in Chapter II-6 for an average water year, along with actual flow levels. As that figure shows, the biological flow recommendations call for more water than is in the river during the peak runoff season from April through June. Because the Yampa River is largely unregulated by storage projects, it is not practical to achieve higher peak flows through reservoir management practices. Unless sufficient progress is made under the Upper Basin RIP, further depletions of Little Snake River waters in Wyoming or Colorado may be viewed as adversely affecting the survival and recovery of endangered fishes in the Yampa River. Wyoming's ability to further develop its water resources in the Little Snake Basin may thus be affected.

According to the Bureau of Reclamation, Wyoming's depletions of the Little Snake River are expected to increase from 14,000 acre-feet in 1993 to 32,000 acre-feet by the year 2020. Most of this increase would result from the construction of a new reservoir on Savory Creek at the Sandstone site in southern Carbon County. The purpose of the proposed reservoir is to supply 12,000 acre-feet of supplemental irrigation water annually to farmers and ranchers in the Little Snake Valley (WWDC 1993). The remaining 6,000 acre-feet of projected depletions would come from increased diversions of Little Snake water for municipal use from an existing trans-basin diversion project.

The projected 6,000 acre-feet annual increase in depletions for municipal use in Wyoming's Little Snake Basin would be unaffected because the project has received all necessary Federal permits (see footnote 1 in Section A.1). The proposed Sandstone project, however, will require new Federal construction permits. Because of the project's potential adverse impact upon flows in the lower Yampa River, permitting the facility may be difficult. As a result, Wyoming could forego development of 12,000 acre-feet of irrigation water annually due to endangered fish considerations. An analysis of cropping patterns and yields for irrigated agriculture in the Little Snake Valley indicates that 12,000 acre-feet of supplemental irrigation water would increase the value of crop production by approximately $362,000 annually. This increased output may be foregone if the Sandstone Project cannot be permitted.[55]

c. Recreation

Wyoming's potential inability to develop Sandstone Reservoir would also affect the recreation sector of the local economy. An economic study of Sandstone Reservoir funded by the Wyoming Water Development Commission indicates that the reservoir would generate approximately $111,000 in new, non-resident expenditures on an annual basis (WRC 1989). These expenditures also would be foregone if the project is not built.

d. Other Impacts

Because no critical habitat has been proposed for the Little Snake River in Wyoming, no other economic impacts are expected.

5. Overall Impacts

The State-level direct impacts for Wyoming are obtained by summing the impacts for each of the river basins and reaches as discussed above. These overall direct impacts are summarized in Table II-9-WY-1.

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[55] Agricultural output impacts for the Little Snake Basin were estimated using cropping patterns and yields from a recent study of agricultural production in the Basin by Western Water Consultants (1992). The cropping pattern and yield estimates are based upon the results of a survey of producers conducted during the summer of 1991. Crop prices used in the analysis were averages for the years 1989 through 1991 as reported in the *Agricultural Prices Summary*, published annually by the USDA's National Agricultural Statistics Service. Water requirements for irrigated crops were taken from the *Colorado Irrigation Guide* (1988) and the Western Water Consultants study (1992). A nominal opportunity cost for dryland farming and grazing was deducted from the impact projections.

Table II-9-WY-1. Direct Impacts for Wyoming
Millions of 1982$

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	-0.362	-0.362	-0.362	-0.362	-0.362	-0.362
Recreation	-0.111	-0.111	-0.111	-0.111	-0.111	-0.111
Non-petroleum Mining	0.000	0.000	0.046	0.009	0.102	0.075
TOTAL DIRECT IMPACTS	-0.473	-0.473	-0.427	-0.464	-0.371	-0.398

F. Appendix to Chapter 9

1. Introduction

This appendix provides additional detail concerning the methods and assumptions employed in estimating the direct economic impacts of listing and proposed critical habitat designations for endangered fish in the Upper Basin. It is intended to supplement the description of impacts contained in Chapter II-9. The appendix covers only those river segments and economic uses for which direct impacts were quantified and used as inputs to the I-O and CGE models.

2. Colorado

a. The Colorado River

(1) Consumptive Water Uses

The U.S. Bureau of Reclamation's (Reclamation's) CRSS model utilizes projections of future water depletions in the Upper Basin to simulate future hydrologic conditions. These projections indicate that depletions of the Colorado River in Colorado are expected to increase by 202,000 acre-feet by the year 2020. The effects of these increased depletions can be seen in the hydrographs in Figure II-6-6 of Volume II, Chapter II-6.

Approximately 131,000 acre-feet of the projected depletions are attributable to projects that have undergone Section 7 Consultations with the USFWS. The remaining 71,000 acre-feet of depletions, intended for municipal use in the greater Denver area, were assumed to be foregone due to listing and proposed critical habitat designations.

It was assumed that the result of these foregone depletions would be the transfer of 71,000 acre-feet of irrigation water in Weld County, Colorado to municipal use in the greater Denver area. The effects of this transfer on agricultural output in Colorado were estimated using representative irrigated and dryland cropping patterns and yields for Weld County as presented in Tables II-9-AP-1 and II-9-AP-2. Table II-9-AP-1 shows that estimated irrigated output in Weld County is $397.87 per acre. Table II-9-AP-2 shows that estimated dryland output is $30.60 per acre. We assumed that irrigation water transferred to municipal use would cause irrigated land to revert to dryland production at a net output loss of $397.87 - $30.60 = $367.27 per acre.

The amount of irrigated acreage that would need to be retired to provide 71,000 acre-feet of water for municipal use was based upon estimates of consumptive irrigation water use in Weld County. According to the Colorado Irrigation Guide (1988), the irrigated cropping pattern in Table II-9-AP-1 would consumptively use approximately 16.4 inches of water annually. It was assumed that an additional 4.6 inches would be consumptively used through evaporation, resulting in a total transferable yield of 21 inches or 1.75 acre-feet annually. As a result, approximately 40,570 acres of irrigated land would have to be retired to provide 71,000 acre-feet of municipal water by the year 2020. The resulting net output loss would be approximately 14.9 million annually by the year 2020.

The $14.9 million annual output loss in the year 2020 was allocated to the livestock feed and other crops economic sectors based upon the cropping pattern in Table II-9-AP-1. The direct output impact was then allocated over time proportion to the rate of projected depletions used in the CRSS model. The resulting schedule of impacts is given in Table II-9-AP-3.

Table II-9-AP-1. Estimated Irrigated Output Per Acre - Weld County, Colorado

Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Corn grain	0.37	152.0 bu.	$ 2.38	$133.85
Alfalfa	0.21	51.0 tons	81.50	87.29
Corn silage	0.15	24.5 tons	21.00	77.18
Dry beans	0.08	21.5 cwt	19.80	34.06
Pasture	0.06	3.8 AUMS	10.00	2.28
Sugar beets	0.05	21.5 tons	41.75	44.88
Barley	0.05	79.0 bu.	3.11	12.28
Wheat	0.03	64.0 bu.	3.15	6.05
Output per acre				$397.87

[1] Cropping patterns were derived from the U.S Census of Agriculture for 1982 and 1987. Data from the two censuses were averaged, and only those crops representing more than three percent of irrigated acreage in the county were included.

[2] Yields are based upon those reported for Weld County by the Colorado Agricultural Statistics Service for the years 1986-1991, except for corn silage, which is a statewide average for the same years.

[3] Crop prices are the average of 1989-1991 prices for Colorado contained in the Agricultural Price Summary, published annually by the National Agricultural Statistics Services of the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The resulting total is the weighted average output per irrigated acre for Weld County.

Table II-9-AP-2. Estimated Dryland Output Per Acre - Weld County, Colorado

Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Fallow	0.40	-	-	-
Wheat	0.32	30.0 bu.	$ 3.15	$30.24
Pasture	0.09	0.4 AUMS	10.00	0.36
Idle	0.09	-	-	-
Cover crops	0.06	-	-	-
Failed crops	0.04	-	-	-
Output per acre				$30.60

[1] Cropping patterns were derived from the U.S Census of Agriculture for 1982 and 1987. Data from the two censuses were averaged, and only those crops representing more than three percent of irrigated acreage in the county were included.

[2] Yields are based upon those reported for Weld County by the Colorado Agricultural Statistics Service for the years 1986-1991, except for corn silage, which is a statewide average for the same years.

[3] Crop prices are the average of 1989-1991 prices for Colorado contained in the Agricultural Price Summary, published annually by the National Agricultural Statistics Services of the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The resulting total is the weighted average output per irrigated acre for Weld County.

Table II-9-AP-3. Projected Direct Output Impacts - Weld County, Colorado

		Lost Output ($ millions)	
Year	Acres Retired	Livestock Feed	Other Crops
1995	7,900	$ 2.297	$ 0.630
2000	15,980	4.595	1.261
2005	21,990	6.322	1.735
2010	28,280	8.129	2.231
2015	34,420	9.896	2.716
2020	40,570	11.663	3.200

b. The Gunnison River

(1) Recreation

Flows in the proposed critical habitat reach of Colorado's Gunnison River are controlled by the federal reservoirs, Blue Mesa, Crystal and Morrow Point. These reservoirs have and will be reoperated to provide flow conditions favorable to endangered fish. The recreational impacts of reservoir reoperations were analyzed for the following river segments:

- the segment within Black Canyon of the Gunnison National Monument;
- the segment from Black Canyon of the Gunnison National Monument downstream to the Uncompaghre River;
- the segment from the Uncompaghre River downstream to the Colorado River; and,
- the coldwater fishery at Blue Mesa Reservoir.

The analysis of recreation impacts within Black Canyon of the Gunnison National Monument was based upon a survey questionnaire completed by monument officials (BCGNM, 1993). They believe that the quality of recreational experiences within the monument will improve due to reservoir reoperation, although no changes in the number of recreational days are expected.

The analysis of recreational impacts from the monument downstream to the Gunnison-Uncompaghre confluence was based upon a 1989 Bureau of Reclamation EIS for the AB Lateral Project (Reclamation, 1989). That study indicates that river flows affect rafting angling and rafting use of the river according to the parameters in Table II-9-AP-4. We used CRSS model runs for water years 1967 through 1985 to estimate the percentage of months with mean flows in each interval for both with-fish and without-fish scenarios. The results are depicted in Table II-9-AP-5 for the months of May through October, the primary recreational season.

The percentage use statistics in Table II-9-AP-4 were multiplied by the relative frequencies in Table II-9-AP-5 and then results were summed to estimate the percentage of maximum use under the with-fish and without-fish scenarios. The results are presented in Table II-9-AP-6. The results in Table II-9-AP-6 were then applied to the recreational activity days reported by Reclamation to estimate direct impacts as shown in Table II-9-AP-7. It was assumed that non-local recreational expenditures would be a net gain or loss to the Colorado economy, while local expenditures would be unaffected by flow changes because local river users are less likely to substitute out-of-state sites or activities. The percentage estimates of non-local use are professional opinions based upon conversation with CDOW personnel and survey information provided by the Black Canyon of the Gunnison National Monument.

The analysis of recreation impacts for the Gunnison River from the Uncompaghre River downstream to its confluence with the Colorado River was based upon a survey questionnaire completed by the BLM Uncompaghre Basin Resource Area (1993). That survey response indicates that the lower Gunnison River receives approximately 6,000 activity days of use annually, and that flow alterations to accommodate endangered fish would reduce recreational usage by about 2,000 activity days annually. We assumed that 50 percent of the lost activity was non-local and would be lost to the state economy. Assuming a $40 per activity day expenditure loss of 1,000 activity days annually yields a $40,000 annual direct expenditure impact.

The analysis of recreation impacts at Blue Mesa Reservoir was based upon a survey questionnaire completed by the Colorado Division of Wildlife (CDOW, 1993). The results of that survey and the resulting impact projections are discussed in Section 4.c of Chapter 9.

Table II-9-AP-4. Projected Flow Impacts on Recreational Use of the Gunnison River Below the Monument

Mean Monthly Flow (cfs)	Percentage of Maximum Raft Launches: Commercial	Percentage of Maximum Raft Launches: Private	Percentage of Maximum Angler Use
> 1,000	100	100	25
800 - 1,000	100	100	50
600 - 800	100	100	75
450 - 600	75	67	100
300 - 450	50	33	100

Source: Reclamation (1989)

Table II-9-AP-5. Projected Frequency of Gunnison's River Flows Below the Monument - May through October

Mean Monthly Flow (cfs)	Relative Frequency: Without Fish	Relative Frequency: With Fish
> 1,000	0.561	0.588
800 - 1,000	0.158	0.114
600 - 800	0.149	0.070
450 - 600	0.053	0.079
300 - 450	0.079	0.149
Totals	1.000	1.000

Source: CRSS model runs for water years 1967 through 1985, current depletion levels.

Table II-9-AP-6. Projected Recreational Use of Gunnison River Below Monument

Activity	Percentage of Maximum Use Without Fish Flows	Percentage of Maximum Use With Fish Flows	Percentage Change
Commercial rafting	94.7	83.1	-13.2
Private rafting	93.0	82.5	-11.3
Fishing	46.3	48.5	4.8

Table II-9-AP-7. Projected Direct Recreational Expenditure Changes for Gunnison River Below Monument

Activity	Activity Days Without fish[1]	Activity Days Change w/fish	Proportion Non-local	Expenditure Per Activity Day	Direct Impacts
Commercial rafting	1,985	-262	.90	$175.00[2]	-$41,300
Private rafting	2,680	-303	.50	40.00[3]	- 6,100
Fishing	17,700	885	.50	40.00[3]	17,700
Total Direct Impact					-$29,700

[1] From Reclamation (1989).

[2] From interviews with commercial rafting companies.

[3] From CDOW (1992).

c. The Yampa River

(1) Consumptive Water Uses

Depletion projections utilized by Reclamation's CRSS model indicate that an additional 30,000 acre-feet of Yampa River water will be consumptively used by the year 2020. The effects of these projected depletions can be seen in the hydrographs in Figure II-6-2 of Chapter II-6.

Approximately 9,000 acre-feet of the projected depletions have undergone Section 7 Consultation with the USFWS. The remaining 21,000 acre-feet of depletions, intended for energy production in the Little Snake drainage, were assumed to be foregone due to listing and proposed critical habitat designations.

It was assumed that the result of these foregone depletions would be the transfer of 21,000 acre-feet of irrigation water in the Little Snake Basin to industrial use. The effects of this transfer on agricultural output in Colorado were estimated using representative irrigated cropping patterns and yields for the area as presented in Table II-9-AP-8. That table shows that estimated irrigated output in the Basin is $151.09 per acre. It was assumed that irrigation water transferred to industrial use would cause irrigated land to revert to dryland grazing with an annual productivity of 0.4 animal unit months (AUMS). Net output per acre impacts were computed as $151.09 - (.4 aum) ($10/aum) = $147.09 per acre.

The amount of irrigated acreage that would need to be retired to provide 21,000 acre-feet of water for industrial use was derived from estimates of consumptive irrigation water use in the area. According to Pochop, et. al (1992), the irrigated cropping pattern in Table II-9-AP-8 would consumptively use approximately 24 inches, or 2.0 acre-feet of irrigation water annually. As a result, approximately 10,500 irrigated acres would have to be retired to provide 21,000 acre-feet of industrial water annually by the year 2020. The resulting net output loss would be approximately $1.54 million annually by the year 2020.

The $1.54 million annual output loss in the year 2020 was allocated to the livestock feed sector of the Colorado economy. The output loss for years prior to 2020 was allocated proportional to the projected rate of depletions used in the CRSS model.

Table II-9-AP-8. Estimated Irrigated Output Per Acre - Little Snake Basin, Colorado

Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Native hay	0.38	2.3 tons	$71.33	$62.34
Seeded grass hay	0.37	2.3 tons	71.33	60.70
Irrigated pasture	0.14	2.2 AUMS	10.00	3.08
Alfalfa	0.11	3.0 tons	75.67	24.97
Output per acre				$151.09

[1] Cropping patterns were derived from the U.S. Census of Agriculture for 1982 and 1987. Data from the two censuses were averaged, and only those crops representing more than three percent of irrigated acreage were included.

[2] Yields were taken from a survey of irrigated agriculture in the Little Snake Basin by Western Water Consultants (1992).

[3] Crop prices are the average of 1989-1991 prices for Colorado contained in the Agricultural Price Summary, published annually by the National Agricultural Statistics Services for the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The resulting total is the weighted average output per irrigated acre for Weld County.

d. The San Juan River

(1) Recreation

The analysis of recreational impacts in the San Juan drainage of Colorado was based upon the results of a survey questionnaire completed by the Colorado Division of Wildlife (CDOW, 1993). The CDOW believes that warm water fish stocking restrictions would adversely affect warm water fishing opportunities in the San Juan and Gunnison Basins in Colorado, resulting in the loss of up to 50,000 activity days of angling annually in the two basins combined. No information is available on how the impacts would be allocated between the basins and we reported the impacts as a total for the San Juan drainage.

We assumed that 50 percent of the lost fishing activity days were non-local and the associated recreational expenditure would be lost to the Colorado economy (i.e.; (.50) (50,000) ($40) = $1.0 million annually). The percentage estimates of non-local use are professional judgements based upon conversations with CDOW personnel. The $40 daily expenditure estimate is based upon variable fishing expenditures reported by the CDOW (1992).

3. New Mexico

a. The San Juan River

(1) Consumptive Water Uses

Depletion projections utilized by Reclamation's CRSS model indicate that an additional 242,000 acre-feet of San Juan River water in New Mexico will be consumptively used by the year 2020. The effects of these projected depletions can be seen in the hydrographs in Figure II-6-10 of Chapter II-6.

Approximately 84,000 acre-feet of the projected depletions have undergone Section 7 Consultation with the USFWS. The remaining 158,000 acre-feet of depletions, most of which is intended for expansion of the Navajo Indian Irrigation Project (NIIP) near Farmington, New Mexico, were assumed to be foregone due to listing and proposed critical habitat designations.

The direct effects of foregone future depletions in the San Juan Basin of New Mexico were estimated using representative irrigated cropping patterns and yields for the area as presented in Table II-9-AP-9. That Table shows that estimated irrigated output in the area is $353.67 per acre. It was assumed that in the absence of further irrigation development, potentially irrigable lands would remain in dryland production, with an annual productivity of 0.4 AUMS. Foregone output per acre was thus computed as $353.67 - (.4 AUMS) ($10.00/AUMS) = $349.67 per acre.

The amount of irrigated acreage that would be foregone was computed using consumptive use statistics for the existing 54,500 irrigated acres in the NIIP. The existing NIIP irrigated acreage consumes 137,000 acre-feet of water annually, on the average, for an average of 2.44 acre-feet per acre. Applying that same factor to 158,000 acre-feet of foregone diversions means that approximately 64,700 acres of irrigated development would be foregone in the basin. At a foregone output of $349.67 per acre, total foregone output would average approximately $22.6 million annually by the year 2020.

The $22.6 million annual output loss in the year 2020 was allocated to the livestock feed and other crops economic sectors based upon the cropping pattern in Table II-9-AP-9. The direct output impact was then allocated over time proportional to the rate of projected depletions used in the CRSS model.

Table II-9-AP-9. Estimated Irrigated Output Per Acre - San Juan County, New Mexico				
Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Alfalfa	0.500	3.5 tons	$111.50	$195.13
Wheat	0.250	65.0 bu.	3.11	50.54
Corn	0.125	150.0 bu.	2.68	50.25
Corn silage	0.125	22.0 tons	21.00	57.75
Output per acre				$353.67

[1] U.S. Census of Agriculture and USDA agricultural statistics for San Juan County are not available because of disclosure problems with the NIIP. This cropping pattern was determined using professional judgement based upon U.S. Census of Agriculture statistics for other areas of northwestern New Mexico and southwestern Colorado.

[2] Yields were determined using professional judgement based upon agricultural statistics published by the USDA for northwestern New Mexico and southwestern Colorado.

[3] Crop prices are the average of 1989-1991 prices for New Mexico contained in the Agricultural Price Summary published annually by the National Agricultural Statistics Services of the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The results total is the weighted average output per irrigated acre for Weld County.

4. Utah

a. The Colorado River

(1) Recreation

The analysis of recreational impacts along the Colorado River in Utah was based upon CRSS model runs for water years 1967 through 1985 and personal interviews with commercial rafting companies in the Moab, Utah area. The results of the personal interviews were used to establish the following acceptability criteria for rafting:

River Stretch	Acceptable Flows (cfs)	
	Minimum	Maximum
Westwater Canyon	3,000	20,000
Cataract Canyon	5,000	40,000

CRSS model runs for water years 1967 through 1985 were then analyzed to estimate the percentage of months during the recreation season (May through October) with acceptable rafting conditions. The results of this analysis are presented in Tables II-9-UT-1 and II-9-UT-2 of Chapter II-9. The accompanying text describes the other assumptions used in the analysis of direct impacts.

b. The Green River

(1) Recreation

The analysis of recreational impacts along the Green River in Utah was based upon CRSS model runs for water years 1967 through 1985 and personal interviews with commercial rafting companies in the Moab, Utah area. The results of the personal interviews were used to establish the following acceptability criteria for rafting:

River Stretch	Acceptable Flows (cfs)	
	Minimum	Maximum
Lower Green	3,000	No limit

The CRSS model runs for water years 1967 through 1985 were analyzed to estimate the percentage of months during the recreation season (May through October) with acceptable rafting conditions. The results of this analysis are presented in Table II-9-UT-3 of Chapter II-9. The accompanying text describes the other assumptions used in the analysis of direct impacts.

c. The Duchesne River

(1) Recreation

The analysis of recreation impacts in the Duchesne River drainage of Utah was based upon a survey questionnaire completed by the UDWR. The results of that survey and the resulting impact projections are discussed in Section C.5 of Chapter II-9.

d. The White River

(1) Consumptive Water Uses

Depletion projections utilized by Reclamation's CRSS model indicate that an additional 24,000 acre-feet of White River water in Utah will be consumptively used by the year 2020. The effect of these projected depletions can be seen in the hydrographs in Figure II-6-4 of Chapter II-6.

The 24,000 acre-feet of projected depletions, intended for an irrigated project on the Uintah and Ouray Indian Reservation, were soon to be foregone due to listing and proposed critical habitat designations. The effects of this foregone irrigated development were estimated using representative irrigated cropping patterns and yields for Uintah County, Utah, as presented in Table II-9-AP-10. That table shows that estimated irrigated output in Uintah County is approximately $155.66 per acre. We assumed that in the absence of further irrigation development, land would remain in dryland grazing production with an annual productivity of 0.4 AUMS. Net foregone output loss to the economy was thus estimated as $155.66 - (0.4 AUMS) ($10.00/AUMS) = $151.66 per acre.

The amount of irrigated output that would be foregone was estimated using consumptive use requirements for the cropping pattern in Table II-9-AP-10 as reported by the Utah Irrigation Guide (USDA, 1984). Assuming 50 percent irrigation efficiency, the cropping pattern in Table II-9-AP-10 would require a diversion of 3.96 acre-feet of water per acre annually, meaning that approximately 6,060 acres of land could be irrigated from 24,000 acre-feet of storage releases. Foregone agricultural output for 6,060 acres was valued at $151.66 per acre, for a total annual foregone output of approximately $919,000.

The $919,000 annual output loss in the year 2020 was allocated to the livestock feed and other crops economic sectors based upon the cropping pattern in Table II-9-AP-10. The direct output impact was then allocated over time proportional to the rate of projected depletions used in the CRSS model.

Table II-9-AP-10. Estimated Irrigated Output Per Acre - Uintah County, Utah

Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Irrigated pasture	0.52	3.5 sums	$10.00	$ 18.20
Alfalfa	0.35	4.0 tons	76.50	107.10
Grass hay	0.06 0.04	2.2 tons	64.00	8.45
Corn silage		17.5 tons	24.00	16.80
Barley	0.03	75.0 bu.	2.27	5.11
Output per acre				$155.66

[1] Cropping patterns were derived from the U.S Census of Agriculture for 1982 and 1987. Data from the two censuses were averaged, and only those crops representing more than three percent of irrigated acreage in the county were included.

[2] Yields are based upon those reported for Uinta County by the Utah Agricultural Statistics Service for the years 1986-1991, except for corn silage, which is a statewide average for the same years.

[3] Crop prices are the average of 1989-1991 prices for Utah contained in the Agricultural Price Summary, published annually by the National Agricultural Statistics Services of the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The resulting total is the weighted average output per irrigated acre.

5. Wyoming

a. The Little Snake River

(1) Consumptive Water Uses

Depletion projections utilized by Reclamation's CRSS model indicate that an additional 18,000 acre-feet of Little Snake water will be consumptively used in Wyoming by the year 2020. The effects of these projected depletions can be seen in the hydrographs for the Yampa River in Figure II-6-2 of Chapter II-6.

Approximately 6,000 acre-feet of the proposed depletions have undergone Section 7 Consultations with the USFWS. The remaining 12,000 acre-feet of depletions, intended to provide supplemental irrigation water to ranchers in the Little Snake Basin, were assumed to be foregone due to listing and proposed critical habitat designations.

The effects of this foregone irrigation development on the Wyoming economy were estimated using representative cropping patterns and yields for the area as presented in Table II-9-AP-8, in Section B of this appendix. That table shows that estimated irrigated output in the area is $151.09 per acre. We assumed that the value of foregone irrigation water in the area was equal to the difference of this figure and the value of dryland grazing with a productivity of 0.4 AUMS. The net foregone output per acre was computed as $151.09 - (0.4 AUMS) ($10.00/AUMS = $147.09 per acre.

The total amount of irrigated output that would be foregone was computed using consumptive irrigation requirements for the cropping pattern in Table II-9-AP-8 as reported by Pochop, et. al. (1992), assuming 40 percent irrigation efficiency. Based upon these assumptions, 12,000 acre-feet of storage releases would irrigate the equivalent of approximately 2,460 acres annually. At an average foregone output of $147.09 per acre, total annual foregone output would be approximately $362,000 annually.

The $362,000 annual output loss in the year 2020 was allocated to the livestock feed sector of the Wyoming economy. The output loss for years prior to year 2020 was allocated proportionally to the projected rate of depletions used in the CRSS model.

(2) Recreation

The recreation sector of Wyoming's economy was also expected to be affected by the foregone reservoir development. Estimates of foregone recreation expenditures were derived from a 1989 study of Sandstone Reservoir (WRC, 1989), as described in Section D.4 of Chapter II-9.

Volume II

Chapter 10: Direct Economic Impacts — Lower Basin

A. Introduction

This chapter discusses the direct economic impacts that are expected to accrue to the economies of Arizona, California, and Nevada due to the combined effects of species listing and proposed critical habitat designations for endangered fishes. These direct impacts do not include the indirect multiplier effects of species listing and proposed critical habitat designations.

As is the case for the Upper Basin States (discussed in Chapter II-9), the direct economic impacts of listing and proposed critical habitat designations for the Lower Basin States depend upon the outcome of future Section 7 Consultations under the Endangered Species Act. The environment for such consultations is somewhat different in the Lower Basin than in the Upper Basin, however, because there is less water available for development through new storage projects. Furthermore, there is no Recovery Implementation Program for the Lower Basin to serve as a reasonable and prudent alternative for projects that come under Section 7 review by the USFWS.

For these reasons, future Section 7 Consultations in the Lower Basin are more likely to involve water resource management programs and proposed floodplain developments than additional net depletions of river flows. The economies of Lower Basin States may be affected by consultations in the Upper Basin, however, to the extent that such consultations change the availability of hydroelectric power available to Lower Basin States. Lower Basin States may also be affected if planned depletions in Upper Basin States are foregone to maintain flows for endangered fishes.

The following sections of this chapter describe the potential direct economic impacts of future Section 7 Consultations in both the Upper and Lower Basin on the economies of Arizona, California, and Nevada.

B. Arizona[56]

1. Introduction

The State of Arizona contains significant portions of the lower Colorado River (including the lower eight miles of the Little Colorado River) that have been proposed as critical habitat for endangered fishes. Sections of the upper Gila River and its tributaries, the Salt and Verde rivers, also have been proposed for critical habitat designation. These proposals and ongoing recovery efforts for endangered fishes may affect economic activity in the regional economy.

Arizona electric power users also may be affected by changes in hydroelectric generation that result from managing Federal reservoirs in the Colorado River Basin to enhance flows for endangered fishes. Projections of electric power impacts are available only at the State level and are discussed in Section 2, below. Succeeding sections discuss other known impacts attributable to endangered fishes recovery efforts as they affect specific river basins.

2. Hydroelectric Generation

Arizona is projected to experience a reduction in the production of electric power in the early part of the study period. This is offset later as the newly added thermal capacity is brought on line. This addition increases the demands for coal and gas within Arizona and in other States. The declines in electric power are highest in 1995 at $1.5 million (1982$) and are predicted to be somewhat less than that in subsequent periods.[57]

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[56] The sectoral direct impacts are discussed for each State and a table of the overall effects is presented at the end of the discussion for each State.

[57] In all of the following discussions, changes in final demand are in millions of 1982$.

3. The Colorado River

a. Introduction

The lower Colorado River flows out of Glen Canyon Dam in northern Arizona near Page, and then proceeds south and westerly through Grand Canyon National Park to Lake Mead, on the Arizona-Nevada State line. From Lake Mead, the river flows southerly to the Mexican border and forms the State boundary between Arizona and its neighboring States of Nevada and California.

Most of the mainstem Colorado River in Arizona has been proposed as critical habitat for endangered fishes. The proposed boundaries stretch from the Paria River below Lake Powell to Imperial Dam near the Mexican border, including Lakes Havasu, Mohave and Mead, up to full pool elevations. The potential economic impacts of these proposed designations and recovery efforts for endangered fishes are discussed below.

b. Consumptive Water Uses

With the completion of the Central Arizona Project (CAP), Arizona's consumptive use of Colorado River water is expected to increase significantly during the period from 1993 through the year 2000. According to Bureau of Reclamation projections, 1992 depletions averaged 2,105,000 acre-feet, and are expected to increase to 2,800,000 acre-feet by the year 2020 (Bureau of Reclamation 1993). Much of the additional water will go to the expanding urban areas of the greater Phoenix and Tucson areas for municipal and industrial use.

Arizona's future increased depletions of the lower Colorado River through the CAP should not be affected by proposed critical habitat designations or recovery efforts for endangered fishes along the lower Colorado River. The reason is that the CAP diverts water from Lake Havasu that has been released for that purpose from Lake Mead and Lake Mohave. Thus, CAP diversions have no influence upon water levels in Lake Havasu or releases from Lake Havasu. Release patterns from Lake Mead and Lake Mohave have been reviewed in past Section 7 Consultations, and the USFWS believes that additional study is needed to assess the effects of fluctuating water levels in Lake Mohave on endangered fishes. Such fluctuations are primarily due to hydroelectric generation, however, and if operational changes were instituted to stabilize Lake Mohave they should not affect Arizona's CAP diversions (USFWS 1993).

There are a number of non-CAP diversions of Colorado River water in Arizona for municipal, industrial, and irrigation uses. Most of these diversions have been in place for some time, however, and should not be affected by recovery efforts for endangered fishes or proposed critical habitat designations unless there is a change in the amount of water depleted or the method of diversion. Such changes may result in re-initiation of consultation for projects that have already undergone Section 7 Consultations under the Endangered Species Act. Projects that have not undergone Section 7 Consultations may have to do so under the auspices of the Clean Water Act or other Federal legislation if significant changes in depletions or diversion methods are contemplated. The extent of economic impacts that may result from such future consultations is unknown.

c. Recreation

The Colorado River from Lake Powell downstream to Imperial Dam is a heavily utilized recreational resource. There may be several types of recreational impacts along this stretch of river as a result of proposed critical habitat designations and other recovery efforts for endangered fishes. First, flow alterations from Glen Canyon Dam may affect recreational activity along the river between Lake Powell and Lake Mead, including river-based recreation in Grand Canyon National Park. Second, the construction of new recreational facilities in proposed critical habitat areas may be more carefully scrutinized and perhaps limited in the future. Third, the stocking of nonnative warm-water game fishes that compete with native endangered fishes may be prohibited in some areas. These potential impacts are discussed below as they relate to specific river segments.

Recovery efforts for endangered fishes in proposed critical habitat areas between Lake Powell and Lake Mead are expected to include flow alterations from Glen Canyon Dam to enhance endangered fish reproduction and survival. The effects of flow alterations on recreational activity along the Colorado River below Lake Powell have been studied extensively as part of an ongoing environmental impact study for operational changes at Glen Canyon Dam. In 1987, a comprehensive study of river-based recreation in this area was completed by Bishop, et al. That study identified four major categories of recreational use of the river between Glen Canyon Dam and Lake Mead:

1. Scenic day rafting in Glen Canyon;
2. Angling in Glen Canyon;
3. Commercial white-water boating in Grand Canyon; and
4. Private white-water boating in Grand Canyon.

These activities are estimated to generate about $14.5 million annually in direct local expenditures and about $23.1 million annually in total local economic activity (Bureau of Reclamation 1993). Approximately two-thirds of this economic activity is attributable to commercial and private white-water boating in Grand Canyon. The National Park Service (NPS) limits commercial and private white-water boating in the Grand Canyon to 115,500 and 54,450 user days respectively, on an annual basis. There is a long waiting list of private parties for permits to use the river and a number of commercial users that cannot be accommodated under current permit restrictions.

Studies that have been completed for the Glen Canyon EIS indicate that the flow alternatives that would benefit endangered fishes would also increase the quality of white-water floats through the Grand Canyon. Because of NPS use limitations, however, economic activity attributable to recreational use of the river in Grand Canyon is not expected to change (Bureau of Reclamation 1993).

One possible exception to this generalization may be boating activities originating on the Hualapai Indian Reservation below Grand Canyon National Park. The Hualapai Tribe collects recreation access fees from commercial and private white-water boaters who launch at the Diamond Creek access on the reservation. The tribe also operates its own commercial rafting operation, Hualapai River Runners. As of 1991, approximately 2,000 trips were launched from this access annually, and these trips contributed about $800,000 to the local economy. Recreational use of the Colorado River below Diamond Creek has not reached capacity limits and is expected to increase over time regardless of flow alterations at Glen Canyon. No impacts on this activity are expected due to endangered fish recovery efforts (Bureau of Reclamation 1993).

The 1987 Bishop, et al. study found no correlation between river flows and the perceived quality of scenic day-long float trips in Glen Canyon. The number of scenic trips in Glen Canyon is not restricted at present and is expected to increase over time regardless of flow alterations at Glen Canyon. Thus, no economic impacts attributable to endangered fish recovery efforts are expected with respect to scenic day trips in Glen Canyon.

The Colorado River from Glen Canyon Dam downstream to Lee's Ferry is an important tailwater fishery for rainbow trout. The quality of this fishery has varied over the years, and the level of fishing activity has varied in response to the quality of the fishery. As of 1991, this stretch of river received approximately 10,300 visits by anglers and accounted for approximately $1.8 million in local economic activity. As part of the Glen Canyon EIS effort, numerous flow release patterns have been studied in an attempt to balance competing use objectives including hydroelectric generation, recreation, environmental degradation, and endangered fish recovery efforts. In the absence of endangered fishes, future flow patterns from Glen Canyon Dam would be likely to follow the "restricted low fluctuating flow" alternative defined by the Draft EIS (Bureau of Reclamation, 1993). The USFWS preferred alternative for endangered fish recovery is approximated by the "seasonally adjusted steady flow" alternative in that Draft EIS. Thus, any economic impacts associated with endangered fishes could be attributed to differences in these two flow regimes.

Changes in release patterns from Glen Canyon Dam to accommodate endangered fishes may affect the quality of the tailwater fishery below the dam and thus affect the level of angling activity in the area. Unfortunately, there are no biological models available to predict whether endangered fish releases will have a positive or negative impact on the trout fishery above Lee's Ferry when compared to the without endangered fish alternative. Thus, there is no basis for projecting either positive or negative impacts in this study.

Downstream from Grand Canyon, the Colorado River flows into Lake Mead, formed by Hoover Dam, and then into Lake Mohave, formed by Davis Dam near Bullhead City. Both of these reservoirs are part of the Lake Mead National Recreation Area, administered by the NPS. The recreation area receives approximately 11 million activity days of use annually, making it one of the most heavily utilized in the Colorado River Basin. Approximately 5.3 million activity days are associated with water-based recreation.[58]

The Colorado River in Lake Mead National Recreation Area, including Lake Mead and Lake Mohave to their full pool elevations, have been proposed for designation as critical habitat. This designation and probable recovery efforts may affect recreational activity in several ways. First, it is likely that the rate of reservoir fluctuations in Lake Mohave may be restricted during the spring spawning season to enhance recovery efforts for endangered fishes. The slight stabilizing effects of this action may, if anything, enhance the quality of reservoir-based recreation in spring months. No significant increases in utilization are expected to result from this change, however, and, thus, no changes in regional economic activity have been projected.

Proposed critical habitat designations may also affect plans to construct new recreational facilities in areas within the 100-year floodplain or below the full pool level on Lake Mead and Lake Mohave. No information on the potential magnitude of these impacts is available for this draft report.

Lake Mead is a popular fishery for both largemouth and striped bass. It is jointly managed by the States of Arizona and Nevada. Bass populations in the lake are naturally reproducing and are not expected to be negatively affected by recovery efforts for endangered fishes. A similar situation exists in Lake Mohave, where the primary game fishes are naturally reproducing striped bass and stocked rainbow trout in upper reaches of the reservoir. Neither the natural reproduction of striped bass or the stocking of rainbow trout are expected to be adversely affected by recovery efforts for endangered fishes.

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[58] This estimate of recreational use is the authors' estimate based upon a variety of reports and other information provided by the U.S. Department of Interior, National Park Service, and the State of Arizona.

One activity that may be affected by endangered fish recovery efforts, however, is future sport fishery enhancement projects for Lake Mead and Lake Mohave. According to the Arizona Game and Fish Department (AGF)(1993), the sport fisheries in both reservoirs could be significantly improved by habitat enhancement projects that would benefit both bass and forage fish populations. Actions to enhance nonnative fish populations, however, may trigger Section 7 Consultations with the USFWS and be deemed detrimental to endangered fish populations. Thus, potential improvements in the sport fisheries in Lake Mead National Recreation area may be altered or foregone to protect endangered fishes.

The foregone economic activity that may be associated with stabilizing the fisheries at current production levels is speculative. For purposes of this draft report, it was assumed that in the absence of endangered fishes, an additional 50,000 activity days of angling could be generated on the two reservoirs by the year 2020 by habitat improvements. At an average expenditure of $50 per activity, the foregone direct economic activity would be $2.5 million annually.[59] This impact was attributed equally to the State economies of Arizona and Nevada.

Downstream from Davis Dam, the Colorado River passes the Fort Mohave Indian Reservation, the Topack Gorge, and flows into Lake Havasu. This river reach receives an estimated 5.8 million activity days of recreational use annually, of which over 250,000 activity days are associated with sport fishing (BLM 1993; BRC 1991; ASP 1989). The principal public recreation area along this stretch of the river is Lake Havasu State Park.

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[59] The estimate of lost activity days is the authors' based upon conversations with the Arizona Game and Fish Department (1993). The expenditure estimate of $50.00 per activity day is based upon survey results published by Behavior Research Center, Inc. (1991), and the Arizona State Parks Board (1988).

The river immediately below Davis Dam is a cold-water fishery for stocked rainbow trout. From Needles, California, to Parker Dam on Lake Havasu, there are self-sustaining populations of striped bass, channel catfish, and bluegill.

Potential impacts to recreation along this corridor include possible restrictions on recreation facilities in critical habitat areas and restrictions of sport fishery enhancement programs. No information on potential new recreational facilities that might be affected along this stretch of river is available for this draft report. With respect to fishery enhancement programs, there is currently a multi-agency program to improve fishery habitat in Lake Havasu. This program will address both habitat requirements for the existing sport fishery and habitat improvements for endangered fishes. The lead agency is the BLM Havasu Resource Area, with cooperation from other agencies including the AGF. According to the AGF, future angling activity should increase on Havasu because the habitat project will tend to concentrate sport fishes in areas where they are more accessible to anglers. It is not appropriate to attribute this positive impact to endangered fishes, however, because a habitat improvement program solely for sport fishes may have been instituted in their absence.

Downstream from Parker Dam, the Colorado River flows through Buckskin Mountain State Park, the Colorado River Indian Reservation, and the Cibola and Imperial National Wildlife Refuges before flowing into Imperial Reservoir behind Imperial Dam. Approximately 5.7 million activity days of recreation occur along this stretch of the river annually (BLMHRA 1993; ASP 1989; BRC 1991). The fishery along this stretch of the river is of less importance than boating, camping, and other outdoor recreational uses. The river contains the same complement of sport fishes that exists in Lake Havasu, although flathead catfish become more prominent on the lower river near Imperial Dam (AGF 1993). Populations of warm-water fishes in this stretch of river and reservoir are self-sustaining. Habitat improvement plans are also being pursued along this stretch of river to benefit both endangered fishes and the sport fishery. Resource managers at Buckskin State Park indicate that no new recreational facilities are planned in proposed critical habitat areas (BSP 1993). No other information is available for this draft report concerning new recreational facilities that may be planned for this reach of the Colorado River.

d. Other Impacts

Proposed critical habitat designations on the Colorado River may affect future floodplain developments along some sections of the lower Colorado River in Arizona. This potential is particularly high in the area between Davis Dam and Lake Havasu City. Most of the Arizona riverbank along this stretch of the river is privately owned or belongs to the Fort Mojave Indian Tribe. Riverbank developments have been growing in recent years in response to increased recreational use of the river and gaming industry growth around Laughlin, Nevada.

Private landowners and the Fort Mojave Tribe are concerned that future riverbank developments may be thwarted by proposed critical habitat designations (FMIT 1993; McKellips 1993). Furthermore, Lake Havasu City officials are concerned that restrictions on waterfront activities could affect city services including a water treatment plant (LHC 1993). Conceptually, there may be some increased costs associated with planned waterfront developments to avoid adverse modifications to critical habitat along this stretch of river. The potential magnitude of these costs is unknown. From a sociological perspective, the additional regulations imposed by critical habitat designations may also increase the potential for conflicts between resource managers and resource users.

4. The Gila River

a. Introduction

The Gila River arises in the Mogollon Mountains of New Mexico's Gila National Forest and flows westerly across the State of Arizona to its confluence with the Colorado River near Yuma. The section from the New Mexico-Arizona State line east to Coolidge Dam on the San Carlos Indian Reservation near Globe, Arizona, has been proposed as critical habitat for endangered fishes. The proposal also includes sections of two upper Gila River tributaries: Bonita Creek and Eagle Creek. Proposed critical habitat reaches include Eagle Creek from the Phelps-Dodge pumping plant downstream to its confluence with the Gila River, and Bonita Creek from the infiltration gallery downstream to the Gila.

The upper Gila River reaches proposed as critical habitat are not controlled by Federal reservoirs. As a result, there will not be economic impacts associated with flow alterations to enhance endangered fish survival and recovery. The other types of economic impacts expected to result from critical habitat designations and recovery efforts are discussed below.

b. Consumptive Water Uses

The Gila River in Arizona is fully appropriated in the sense that there are no significant amounts of additional water that can be developed for consumptive use without affecting existing uses. Some of the more important current water uses in proposed critical habitat areas include a municipal water supply for Safford and surrounding communities from Bonita Creek. Phelps Dodge Morenci, Inc. (PDMI) diverts water from Eagle Creek, the Black River, and groundwater wells in the Eagle Creek drainage to supply a large copper mining complex near Morenci that employs over 2,000 people (PDMI 1993). There are also numerous ground- and surface-water diversions along the Gila that support irrigated agriculture.

Most of these diversions have been in place for some time, and should not be affected by listing or proposed critical habitat designations unless there is a change in the amount of water depleted or the method of diversion. Such changes may trigger the reinitiation clause in the biological opinions for projects that have undergone Section 7 Consultations under the Endangered Species Act. Projects that have not under undergone Section 7 Consultations may have to do so under the auspices of the Clean Water Act or other Federal legislation if significant changes in depletions or diversion methods are contemplated. The extent of economic impacts that may result from such future consultations is unknown.

Another uncertainty affecting future consumptive water uses in the upper Gila watershed is the status of Federal reserved water rights for the San Carlos Indian Reservation. Tribal water rights in the Gila watershed have yet to be determined as part of a general adjudication of water rights in the Gila Basin. It is possible that the exercise of tribal water rights in the future could either enhance or hinder USFWS's efforts to recover endangered fishes in proposed critical habitat areas, depending upon the magnitude and location of proposed diversions. At this time, however, the flow requirements for recovering endangered fishes in the Gila are unknown. This uncertainty, coupled with the unknown nature of future tribal diversions, makes quantification of economic impacts impractical.

c. Recreation

Portions of the lands along the Gila River and Bonita Creek are administered by the BLM Gila Resource Area. These lands currently receive relatively little recreation use, averaging about 1,000 activity days annually (BLMHRA 1993). The remaining lands in proposed critical habitat areas are either privately owned or a part of the San Carlos Indian Reservation. No information on recreational use of these lands is available for this draft report.

The BLM Gila Resource Area is preparing a draft plan for recreational use of the Gila Box Riparian Conservation Area that covers portions of the Gila River and Bonita Creek. The draft plan has several alternatives involving boat ramps, access roads, and other recreational developments that may conflict with the recovery of endangered fishes. The economic impacts associated with modifying or mitigating the recreational plans to accommodate endangered fishes are unknown.

d. Other Impacts

Recovery efforts for endangered fishes may also affect activities in the floodplain such as oil, gas, and gravel operations, which would be more closely monitored in the future. There are also indications that the 100-year floodplain may include agricultural areas and portions of several smaller communities along the Gila River (PDMI 1993). Most existing developments in the 100-year floodplain would be excluded from critical habitat designation because the primary constituent elements of habitat are not present. Future floodplain developments, however, may be restricted. The extent of economic effects attributable to such restrictions is unknown.

The impacts of endangered fish recovery efforts on archeological sites along the Gila is expected to be positive because stream-side activities that might adversely affect archeological sites will be more closely monitored. From a sociological perspective, the additional regulations imposed by critical habitat designations may increase the potential for conflicts between resource managers and resource users.

5. The Salt River

a. Introduction

The Salt River is a tributary of the Gila that arises in mountainous areas of the San Carlos and Fort Apache Indian Reservations, and then flows southwesterly to its confluence with the Gila near Phoenix. The portion of the river from the old U.S. Highway 60/State Route 77 bridge downstream to Roosevelt Division Dam has been proposed as critical habitat for endangered fishes. The lower portions of two tributaries, Cherry Creek and Canyon Creek, are also included in the critical habitat proposal. Portions of the proposed critical habitat areas are on the Fort Apache Indian Reservation, occupied by the White Mountain Apache Tribe and the San Carlos Indian Reservation.

The reaches of the Salt River and its tributaries that have been proposed as critical habitat are not controlled by Federal reservoirs. As a result, there will not be economic impacts associated with altered flow releases to enhance endangered fish survival and recovery. The other economic impacts expected to result from critical habitat designations and recovery efforts are discussed below.

b. Consumptive Water Uses

The Salt River and its tributaries that have been proposed as critical habitat lie in relatively remote areas of Tonto National Forest and the Fort Apache Indian Reservation with limited current consumptive water uses. There is uncertainty, however, concerning future depletions of the upper Salt River and its tributaries pending resolution of reserved water rights for the San Carlos and White Mountain Apache Tribes. Although a tentative settlement has been reached concerning reserved water rights for San Carlos uses of the Salt River, White Mountain Apache reserved rights remain unresolved. It is possible that the exercise of tribal water rights in the future may conflict with USFWS's efforts to recover endangered fishes in proposed critical habitat areas. At this time, however, the flow requirements for recovering endangered fishes in the Salt River are unknown. This uncertainty, coupled with the unknown magnitude of future depletions by the tribes, makes quantification of potential impacts impractical. Such impacts could occur, however, if Federal permits or funding were required for tribal projects that would excessively deplete flows needed to recover endangered fishes.

c. Recreation

Lands along the Salt River and its tributaries that have been proposed as critical habitat are administered by the Tonto Basin Ranger District of Tonto National Forest and by the San Carlos and White Mountain Apache Tribes. The area is relatively remote and the primary recreational activities are non-motorized boating, wilderness camping, and hunting (TNE 1993). None of these activities should be affected by the proposed critical habitat designations with the possible exception of stream-side camping. The Tonto Ranger District has proposed developing two remote campsites in critical habitat areas to reduce damage to riparian zones from high dispersed use during the spring and fall. Evaluation of the positive and negative effects of this proposal on endangered fishes recovery efforts would take place on a site-specific basis.

d. Other Impacts

The impacts of endangered fish recovery efforts on archeological sites along the Salt River are expected to be positive because stream-side activities that might adversely affect archeological sites will be more closely monitored. From a sociological perspective, the additional regulations imposed by critical habitat designations may increase the potential for conflicts between resource managers and resource users.

6. The Verde River

a. Introduction

The Verde River is a tributary of the Salt River that arises in mountainous areas of central Arizona and flows generally southward to its confluence with the Salt below Stewart Mountain Dam east of Phoenix. The Verde River from the dam forming Sullivan Lake to Horseshoe Dam (including Horseshoe Lake) has been proposed for designation as critical habitat. The proposal also includes the lower portions of three Verde River tributaries: Sycamore, Oak, and West Clear creeks. The economic impacts expected to result from critical habitat designations and recovery efforts are discussed below.

b. Consumptive Water Uses

The portions of the Verde River proposed as critical habitat provide water for a variety of municipal, industrial, and agricultural users upstream from Horseshoe Reservoir. Water stored in Horseshoe Reservoir provides approximately 10 percent of the water supply for the city of Phoenix, as well as water for Indian tribes in the Phoenix area (COP 1993).

Horseshoe Reservoir is operated by the Salt River Project, and part of the operational scenario for the reservoir involves periodic lowering of the reservoir to meet downstream water demands and to provide access to the outlet for removing accumulated debris (SRP 1993). Even when lowered, however, the reservoir provides habitat for endangered fishes and lowering may have the side effect of controlling nonnative fishes populations that compete with endangered fishes.

Existing water uses in the Verde River Basin of Arizona should not be affected by recovery efforts for endangered fishes on proposed critical habitat designations unless there is a change in the amount of water depleted or the method of diversion. Such changes may trigger the reinitiation clause in the biological opinions for projects that have undergone Section 7 Consultations under the Endangered Species Act. Projects that have not undergone Section 7 Consultations may have to do so under the auspices of the Clean Water Act or other Federal legislation if significant changes in depletions or diversion methods are contemplated. The extent of economic impacts that may result from such future consultations is unknown.

The effects of recovering endangered fishes on future depletions of the Verde River are unknown. Completion of the CAP has raised the possibility that upstream water users may be able to increase depletions of the Verde for future municipal and industrial use and replace that water with CAP water in the Phoenix metropolitan area.

At this time, the flow requirements for endangered fishes in the Verde River system are unknown. That uncertainty makes it impractical to quantify the impacts of potential conflicts between future upstream depletions and endangered fish recovery efforts. Such impacts could occur, however, if Federal permits were required for projects that would excessively deplete flows needed to recover endangered fishes.

c. Recreation

The Verde River flows through portions of Prescott and Tonto National Forests as well as through Dead Horse State Park in the Verde Valley. Recreational use of the Verde River and Sycamore Creek in the two national forests approximates 355,100 activity days on an annual basis (TNFCCRP 1993; PNFVDR 1993). Approximately 100,000 of those activity days occur at Horseshoe Reservoir. Another 25,000 activity days of use occur along Sycamore Creek on Prescott National Forest. Warm-water fishing, camping, swimming, and boating account for the majority of recreational use.

Proposed critical habitat designations and recovery efforts for endangered fishes should have only minor impacts on recreational usage of public lands in the Verde Valley. The heavily utilized warm-water fisheries in the basin have self-sustaining populations of nonnative fishes and have received very little stocking in recent years. The Arizona Game and Fish Department anticipates no negative fishery impacts if nonnative stocking is discontinued as an adjunct to endangered fish recovery (AGF 1993).

In some areas of Prescott and Tonto National Forests, proposed recreational facilities may encroach on areas proposed as critical habitat. In many cases, these facilities are intended to reduce damage to riparian zones in critical habitat by concentrating use in less sensitive areas. Evaluation of the positive and negative effects of these facilities would take place on a site-specific basis.

d. Other Impacts

Proposed critical habitat areas along the Verde area may have impacts on future developments in the 100-year floodplain, which includes agricultural, industrial, and urbanized areas. The Verde River flows through the corporate limits of the town of Camp Verde, and town officials are concerned that proposed critical habitat designations in the town will limit growth and make flood control improvements difficult or impossible (TCV 1993). Similar issues may exist in the communities of Bridgeport, Clarkdale, and Cottonwood. The economic impact of proposed critical habitat designations on future floodplain developments in these communities is unknown.

The impacts of endangered fish recovery efforts on archeological sites along the Verde River are expected to be positive because stream-side activities that might adversely affect archeological sites will be more closely monitored. From a sociological perspective, the additional regulations imposed by critical habitat designations may increase the potential for conflicts between resource managers and resource users.

7. The Little Colorado River

a. Introduction

The Little Colorado River in mountainous areas of Apache National Forest in western Arizona flows north and westerly through the Navajo Reservation to its confluence with the Colorado River at the upper end of Grand Canyon. The lower eight miles of the river have been proposed as critical habitat for endangered fishes. The economic impacts expected from this critical habitat proposal and recovery efforts for endangered fishes are discussed below.

b. Consumptive Water Uses

There are a variety of existing consumptive water uses along the Little Colorado River in central Arizona involving municipal, industrial, and agricultural users. Designation of critical habitat and recovery efforts on the lower reaches of the river should not affect these existing uses unless a significant change in the amount of diversion or method of diversion triggers a Section 7 Consultation under the auspices of the Endangered Species Act. The extent of economic impacts that may result from such future consultations is unknown.

Another uncertainty affecting future consumptive water uses along the Little Colorado River is the status of reserved water rights for the Hopi and Navajo Tribes. The extent of those rights has yet to be determined. It is possible that the future exercise of tribal water rights may conflict with USFWS's efforts to recover endangered fishes in the Colorado and Little Colorado River. At this time, however, flow requirements for recovering endangered fishes in the lower Little Colorado River are unknown. This uncertainty, coupled with the unknown magnitude of potential depletions by the tribes, makes the quantification of economic impacts impractical. Such impacts could occur, however, if Federal permits or funding were required for tribal projects that would excessively deplete flows that are needed to recover endangered fishes.

c. Recreation

Listing and proposed critical habitat designations on the lower Little Colorado River are expected to have no short-term effects on recreational use of the river. Because the river is not regulated by Federal reservoirs, there will be flow-related effects on recreation from reservoir operational changes. Furthermore, the remote location and topography of the area is not conducive to shoreline developments in the 100-year floodplain that may affect critical habitat.

In the long run, the proposed critical habitat designation may have a positive effect on recreational use of the lower river by ensuring that sufficient water is available for both recreation and endangered fishes.

d. Other Impacts

No other impacts are expected from critical habitat designation or recovery efforts for endangered fishes in the Little Colorado River.

8. Overall Impacts

The direct impacts are summarized in Table II-10-AZ-1 below. Unfortunately, some of the direct impacts cannot be quantified at this time. An example is the potential conflicts between recovery efforts for endangered fishes and the development of Indian water rights on the upper Gila, Salt, and Little Colorado drainages. The extent of potential impacts is unknown, however, pending final resolution of the magnitude of those rights.

The other area of uncertainty with respect to economic impacts involves floodplain utilization along the lower Colorado and upper Gila and Verde rivers. These floodplain areas contain significant amounts of economic activity that if expanded could adversely modify proposed critical habitat. The extent of potential growth in these floodplain areas is unknown.

Table II-10-AZ-1. Direct Impacts for Arizona
(Millions of 1982$)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Recreation	0.0	-0.250	-0.500	-0.750	-1.000	-1.250
Electric Power	-1.474	-0.078	0.634	0.374	-0.867	-0.410
TOTAL DIRECT IMPACTS	-1.474	-0.328	0.134	-0.376	-1.867	-1.660

C. California

1. Introduction

The Colorado River forms the California-Arizona State line from the Nevada border north of Needles, California, downstream to the Mexican border. The river from the Nevada border downstream to Imperial Dam has been proposed for designation as critical habitat for endangered fishes. The economic impacts of this proposal and ongoing recovery efforts for endangered fishes are discussed below.

2. Electric Power

The analysis of electric power impacts conducted by Stone and Webster Management Consultants indicates that California electric utilities and electric power consumers will be unaffected by operational changes of Federal reservoirs in the basin to enhance flows for endangered fishes. Much of California's hydroelectric power from the Colorado River comes from facilities that will not undergo operational changes. The one contract from an affected generating facility can be filled without impact after operational changes are imposed.[60]

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[60] Personal communication; Joel Theis, Stone and Webster Consultants, Inc.

3. Consumptive Water Uses

California diverts over five million acre-feet of water from the Colorado River annually for agricultural, municipal, and industrial water uses in the southern part of the State. Much of this water goes to the Metropolitan Water District of southern California (MWD), a public agency responsible for providing supplemental water supplies to nearly 16 million residents of a 5,200 square mile area in heavily populated areas of southern California (MWD 1993). The MWD diverts its water at the Whitset Intake Pumping Plant on Lake Havasu, where the water enters the Colorado River aqueduct for transport to metropolitan areas near the coast. Other diversions include those by the Colorado River and Palo Verde Indian Tribes on the river below Parker Dam. Further south, the Imperial Irrigation District takes water for irrigation from Imperial Reservoir, and the All American canal diverts water above Laguna Dam for the Coachella Valley Water District and the Fort Yuma Indian Reservation.

California's existing diversions of water from the lower Colorado River should not be affected by listing or proposed critical habitat designations along the lower Colorado River. Water taken by the MWD from Lake Havasu is released for diversion from upstream reservoirs, and the MWD diversions thus have no effect upon water levels in Lake Havasu or releases from Lake Havasu. The biological flow requirements for endangered fishes in the lower Colorado River below Lake Havasu are unknown. There is no evidence, however, that existing diversions below Lake Havasu are harmful to existing populations of endangered fishes.

California's diversions are the last in the United States before the river enters Mexico. Thus, after ensuring that treaty obligations to Mexico are met, California has been able to divert water from the Colorado River that has been unused by upstream States. According to the Bureau of Reclamation, California's depletions of the Colorado River totaled approximately 5.1 million acre-feet in 1992 (Bureau of Reclamation, 1992). Because upstream States have not developed their full entitlements to Colorado River waters, California's depletions of the Colorado River are expected to decline in the future. According to Bureau of Reclamation projections, California's depletions of the Colorado

River are expected to drop from a current level of approximately 5.1 million acre-feet annually to approximately 4.4 million acre-feet by the year 2020. Most of this decline is associated with increased diversions by Arizona through the CAP.

Other sections of this chapter describe a series of projected depletions of the Colorado River system in other States that total 286,000 acre-feet annually by the year 2020. To the extent that these planned depletions in other States are foregone due to endangered fishes, California may benefit because there will be more water available to divert in the lower river. The practical effect would be to slow the projected rate of decline in California diversions of the Colorado River for agricultural, municipal, and industrial purposes.

To assess the potential impacts of this scenario, it was necessary to simplify some assumptions. First, as discussed elsewhere in this draft report, it was assumed that the primary beneficiary of increased water availability in California would be the agricultural sector of the economy. The rationale behind this assumption is that in the face of decreasing water availability, agricultural water will increasingly be reallocated to higher valued municipal and industrial uses in southern California during the period from 1993 through 2020. Recovery efforts and critical habitat designations for endangered fishes were thus assumed to decrease the need for reallocating agricultural water to other uses, thus resulting in a higher agricultural output than would otherwise be the case.

The exact amount of additional agricultural water that may be available for use in California because of endangered fishes is not known because, in part, it is a function of future Section 7 Consultations in other States; the success of the Upper Basin and San Juan RIP's; and evaporation and transit gains and losses on many hundreds of miles of river. A detailed transit study of the basin is not available, but based upon professional judgments, it was assumed that 90 percent of foregone depletions in upstream States would be available for diversion by California, and that 90 percent of California diversions would be available to irrigators (Bureau of Reclamation 1993). Assuming 286,000 acre-feet of diversions are foregone in upstream States, about 232,000 more acre-feet of water would be available annually to southern California irrigators by the year 2020 than would otherwise be the case. This amount of water equates to approximately $86.6 in agricultural output annually, output that may not accrue to the California economy in the absence of endangered fishes.[61]

4. Recreation

The Colorado River from the Nevada border below Davis Dam to Imperial Dam is a heavily utilized recreational resource. A description of recreational resources and their current utilization rates is given in the discussion of Arizona regional impacts in Section A.3.c of this chapter.

The primary impact of proposed critical habitat designations and recovery efforts for endangered fishes along this stretch of river may be restrictions on the construction of new recreational facilities in critical habitat areas. Impact survey responses were received from Picacho State Recreation Area, Imperial National Wildlife Refuge, and the BLM Yuma Resource Area, which manages recreation of both the Arizona and California sides of the lower Colorado River. Two of the three management units indicated that they are planning to construct new recreational facilities in areas proposed for critical habitat designations. It is unknown whether these facilities would modify essential elements of the critical habitat.

5. Other Impacts

Proposed critical habitat designations may also affect future floodplain developments for non-recreational uses. There may thus be some increased costs associated with planned waterfront developments along this stretch of river to avoid adverse modifications to critical habitat. The potential magnitude of these costs is unknown.

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[61] Agricultural output impacts for California were estimated from cropping patterns, yields, crop prices, and water requirements for crops in Imperial and Riverside Counties. Cropping patterns were derived from the U.S. Census for Agriculture for 1982 and 1987. Yields were averaged for the years 1989 through 1992 as reported in annual *Agricultural Crop and Livestock Reports* produced by the Agricultural Commissioners of Imperial and Riverside Counties. Crop prices were taken from *Agricultural Prices Summary*, published annually by the USDA's National Agricultural Statistics Service. California prices for the years 1989 through 1991 were used for the analysis. Water requirements for irrigated crops were based upon information in the *Agricultural Water Use Biennial Report*, May 1993, produced by the California Department of Water Resources in Sacramento. A nominal opportunity cost for dryland farming and grazing was deducted from the impact projections.

Proposed critical habitat designations may also affect management plans for wildlife, other endangered species, archeological sites, and cultural resources. Impacts on archeological sites are expected to be positive to the extent that floodplain activities that might adversely affect archeological sites will be more closely monitored in the future. The additional regulations imposed by critical habitat designations may also increase the potential for conflicts between resource managers and resource users. The magnitude of these impacts is unknown.

6. Overall Impacts

The State-level direct impacts for California are obtained by summing the impacts for each of the river basins and reaches as discussed above. These overall direct impacts are summarized in Table II-10-CA-1.

Table II-10-CA-1. Direct Impacts for California
(Millions of 1982$)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Other Crops	6.555	13.619	29.131	38.745	55.860	72.829
Livestock Feed	1.239	2.575	5.508	7.325	10.561	13.769
TOTAL DIRECT IMPACTS	7.794	16.194	34.639	46.070	66.421	86.598

D. Nevada

1. Introduction

The State of Nevada contains a large portion of the Colorado River within Lake Mead National Recreation area, including both Lake Mead and Lake Mohave. Below Davis Dam, the Colorado River forms the Nevada-Arizona State line downstream for approximately 20 miles to the California border. All of the Colorado River and its reservoirs in Nevada have been proposed as critical habitat for endangered fishes. These proposals and ongoing recovery efforts for endangered fishes may affect economic activity in the local economy.

Nevada electric power users also may be affected by changes in hydroelectric generation that result from managing Federal reservoirs in the Colorado River Basin to enhance flows for endangered fishes. Projections of electric power impacts are available only at the State level and are discussed in Section 2, below. Succeeding sections discuss other known impacts attributable to endangered fish recovery efforts as they affect specific river basins.

2. Electric Power Impacts

No electric power impacts are projected for Nevada. This is a result of the nature of the Stone and Webster Consultants, Inc. results. Additional results from the Stone and Webster Consultants, Inc. that recently have become available will be incorporated into the final economic analysis.

3. Consumptive Water Uses

The Colorado River provides 85 percent of the water needs of the Las Vegas metropolitan area through a treatment and pumping facility on Lake Mead. That facility, located on Saddle Island, diverted and treated approximately 262,000 acre-feet of water in 1992, a figure that could eventually rise to 475,000 acre-feet (LVVWD 1993). Some water is treated and returned to the lake as wastewater; however, according to Bureau of Reclamation projections, Nevada's net depletions of Colorado River water are expected to increase from 192,000 acre-feet in 1992 to 300,000 acre-feet in the year 2020.

To handle this increase, the Las Vegas Valley Water District (LVVWD) is planning an additional treatment facility on Lake Mead. Even with additional treatment capacity, however, southern Nevada's water demands may exceed the State's allocation of Colorado River water by the year 2013 (CRCN 1993). As a result, the Southern Nevada Water

Authority (SNWA) has been pursuing additional water sources to meet future needs in the southern part of the State. Options under consideration include purchasing and/or leasing water rights from other users, trading desalinized water in California for increased diversions from Lake Mead, and developing additional water on Colorado River tributaries that flow into Lake Mead (SNWA 1993).

As presently operated, the LVVWD diversion and treatment facility on Lake Mead is not viewed as harmful to endangered fishes. The intake structure is approximately 90 feet below full pool elevation. In summer months, diversions occur below the lake's thermocline and have no negative impacts. In winter months the depth of withdrawal and relatively small diversions compared to reservoir size make negative impacts unlikely (USFWS 1993).

Plans for expanding Nevada's use of Lake Mead waters may be subject to Section 7 Consultations with the USFWS under the auspices of the Endangered Species Act. Although the outcome of these consultations cannot be predicted with certainty, current information indicates that increased diversions would not adversely affect endangered fishes or their habitat in Lake Mead.

4. Recreation

Lake Mead National Recreation Area is an important recreational resource to the Nevada economy, as is the section of the Colorado River in Nevada below Davis Dam. A description of these recreational resources and their current utilization rates is given in the discussion of Arizona regional impacts in Section B.3.c of this chapter.

As discussed in that section, there are several potential impacts of critical habitat designations and endangered fish recovery efforts on recreational activity in the area. First, stabilization of reservoir fluctuations in Lake Mohave during the spawning season for endangered fishes is expected to enhance the quality of recreational activity during the early spring months. No significant increases in utilization are expected to result from this change, however, and thus no changes in regional economic activity have been projected. Proposed critical habitat designations may also affect plans to construct new recreational facilities below the full pool level on Lake Mead and Lake Mohave. The potential magnitude of these impacts is unknown.

The fisheries in Lake Mead and Lake Mohave are naturally reproducing and are not expected to be affected negatively by recovery efforts for endangered fishes. Likewise, the cold water fishery below Davis Dam will be unaffected. There is a possibility, however, that habitat and other enhancement efforts to improve warm water fisheries in Lakes Mead and Mohave may conflict with recovery activities for endangered fishes (AGF 1993). For purposes of this draft report, it was assumed that an additional 50,000 activity days of angling could be generated on the two reservoirs by the year 2020 in the absence of endangered fishes. Assuming an average expenditure of $50 per activity day, this foregone direct economic activity would be $2.5 million annually.[62] This impact was attributed equally to the State economies of Arizona and Nevada.

5. Other Impacts

Proposed critical habitat designations on the Colorado River may affect future floodplain developments along the Nevada side of the river. This potential is particularly high in the area between Davis Dam and the California State line. Riverbank developments have been growing in this area in recent years in response to increased recreational use of the river and gaming industry growth around Laughlin, Nevada.

Conceptually, there may be some increased costs associated with planned waterfront developments along this stretch of river to avoid adverse modifications to critical habitat. The potential magnitude of these costs is unknown. From a sociological perspective, the additional regulations imposed by critical habitat designations may also increase the potential for conflicts between resource managers and resource users.

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[62] The estimate of lost activity days is the authors' based upon conversations with the Arizona Game and Fish Department (1993). The expenditure estimate of $50.00 per activity day is based upon survey results published by Behavior Research Center, Inc. (1991), and the Arizona State Parks Board (1988).

6. Overall Impacts

The overall direct impacts to the Nevada economy are confined to the recreation sector and are summarized in Table II-10-NV-1.

Table II-10-NV-1. Direct Impacts for Nevada
(Millions of 1982$)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Recreation	0.0	-0.250	-0.500	-0.750	-1.000	-1.250
TOTAL DIRECT IMPACTS	0.0	-0.250	-0.500	-0.750	-1.000	-1.250

E. The Colorado River Basin Region

1. Introduction

Each of the State-level impacts discussed above involves the direct impacts that arise within the individual State. At the region level there are netting effects as negative impacts in one State may be offset by positive impacts in another, and vice versa. The region-level direct impacts are discussed by economic sector in the next sections.

2. Sectoral Impacts

a. Livestock Feed

Negative impacts in the livestock feed sector are due to withdrawal of water in the Upper Basin and in the San Juan valley. Although additional water is thus available to move toward the Lower Basin, the value of livestock feed relative to the other crops sectors is such that this water will be used for crops other than livestock feed.

b. Other Crops

The other crops sector impacts reflect the geographic shift of water use in agriculture from the Upper Basin States to the Lower Basin States. Since the yields per acre are higher with the California cropping patterns the negative direct impacts in the Upper Basin are more than offset by the positive direct impacts of having the additional water available in California.

c. Recreation

It is expected that there will be offsetting effects due to the loss of recreation opportunities within the region. These have not been quantified at this time and the region-wide recreation impacts included in the current analysis are the sum of the negative impacts in the affected States.

d. Electric Power Related Impacts

As discussed above, there are a variety of impacts associated with changes in the hydrograph and the resulting effects on hydroelectric generation. These include the negative impacts in electric power production, positive impacts due to fuel substitution for thermal generation, and positive impacts due to the need to expand capacity in the electric power industry.

3. Overall Impacts

The overall direct impacts used in the analysis of the economic impacts due to listing and the proposed critical habitat are reported in Table II-10-CB-1.

Table II-10-CB-1. Direct Impacts for the Colorado River Basin
(Millions of $1982)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	-3.503	-6.167	-11.340	-13.559	-18.109	-23.359
Other Crops	5.925	12.358	27.378	36.532	53.144	69.629
Recreation	-2.558	-3.686	-3.936	-4.186	-4.436	-4.686
Electric Power	-3.958	-4.120	-8.177	-4.668	-9.664	-0.437
Non-petroleum Mining	2.409	3.394	4.555	3.515	2.130	3.711
Oil and Gas Mining	1.608	1.147	3.463	2.500	8.063	1.680
Construction	6.350	6.350	6.350	6.350	6.350	6.350
Combined Manufacturing	6.350	6.350	6.350	6.350	6.350	6.350
TOTAL DIRECT IMPACTS	12.238	15.626	24.643	32.843	43.828	59.238

F. Appendix to Chapter 10

1. Introduction

This appendix provides additional detail concerning the methods and assumptions employed in estimating the direct economic impacts of listing and proposed critical habitat designations for endangered fish in the Lower Basin. It's intended to supplement the description of impacts contained in Chapter II-10. The appendix covers only those river segments and economic uses for which direct impacts were quantified and used as inputs to the I-O and CGE models.

2. Arizona

a. Recreation

The only recreation impact quantified for the State of Arizona was the loss of 50,000 activity days of angling in Lake Mead and Lake Mojave. The assumptions behind the calculation of this impact are described in Section B.3.c of Chapter II-10.

3. California

a. The Colorado River

(1) Consumptive Water Uses

The U. S. Bureau of Reclamation's CRSS model projections indicate that depletions of the Colorado River in California are expected to decrease from a current level of approximately 5.1 million acre-feet annually to approximately 4.4 million acre-feet by the year 2020. It was assumed that the effects of foregone depletions due to listing and proposed critical habitat designations in Upper Basin states would have the effect of decreasing the rate at which future depletions will decline in the State of California. As discussed in Section C.3 of Chapter 10, 92 percent, or 232,000 acre-feet of the 286,000 acre-feet of foregone diversions in Upper Basin states, would be available annually to southern California irrigators by the year 2020. The value of this additional irrigation water to the California economy was estimated using representative irrigated and dryland cropping patterns and yields for Imperial and Riverside Counties, California. Table II-10-AP-1 shows that estimated irrigated output per acre in Imperial and Riverside Counties is $2,044.45. Table II-10-AP-2 shows that estimated dryland output per acre in Imperial and Riverside Counties is $15.39 per acre. It was assumed that the value of additional irrigation water to the California economy would be the difference between dryland and irrigated production, or $2,044.45 - $15.39 = $2,029.06 per acre.

The amount of acreage that could be irrigated with 232,000 acre-feet of irrigation water was computed using irrigation statistics compiled by the California Department of Water Resources (CDWR, 1993). Studies by the CDWR indicate that irrigators in Imperial and Riverside Counties apply an average of 5.46 acre-feet of irrigation water per acre on an annual basis. Thus, 232,000 acre-feet of additional irrigation water would irrigate approximately 42,500 acres on an annual basis. At a value of $2,029.06 per acre, the direct output effect on the state economy would be approximately $86.2 million annually.

The $86.2 million direct output effect in the year 2020 was allocated to the livestock and other crops economic sectors of the California economy based upon the cropping pattern in

Table II-10-AP-1. The direct output impact was then allocated over time proportional to projected Upper Basin depletions used in the CRSS model. The resulting schedule of impacts is given in Table II-10-CA-1 of Chapter II-10.

Table II-10-AP-1. Estimated Irrigated Output Per Acre - Imperial and Riverside Counties, California

Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Alfalfa	0.32	8.5 tons	$96.00	$ 216.12
Wheat	0.19	94.0 bu.	3.64	65.01
Cotton	0.10	10.4 cwt.	71.50	74.36
Lettuce	0.09	177.0 cwt.	11.90	189.57
Sugar beets	0.06	28.3 tons	40.30	68.43
Grapes	0.06	5.6 tons	439.00	147.50
Cantaloupes	0.05	148.0 cwt.	17.30	128.02
Oranges	0.05	610.0 crates	17.80	542.90
Carrots	0.04	338.0 cwt.	13.00	175.76
Grapefruit	0.04	616.0 crates	15.90	391.78
Output per acre				$2,044.45

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[1] Cropping patterns were derived from the U.S. Census of Agriculture for 1982 and 1987. Data from the two censuses for Imperial and Riverside Counties were averaged, and only those crops representing more than three percent of irrigated acreage were included.

[2] Irrigated yields are from the Agricultural Crop and Livestock Reports by the Agricultural Commissioners of Imperial and Riverside Counties for the years 1989 through 1992. Dryland yields were derived with the help of Gary Foster from the Riverside County Agricultural Commissioners' office.

[3] Crop prices are the average of 1989-1991 prices contained in the Agricultural Price Summary, published annually by the National Agricultural Statistics Services of the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The resulting total is the weighted average output per irrigated acre.

Table II-10-AP-2. Estimated Dryland Output Per Acre - Imperial and Riverside Counties, California

Crop	Proportion[1]	Yield/Acre[2]	Price Per Unit[3]	Weighted Output[4]
Idle	0.49	-	-	-
Summer fallow	0.18	-	-	-
Barley	0.15	17 bu.	$ 2.59	$ 6.60
Wheat	0.06	11 bu.	3.64	2.40
Hay	0.05	1.75 tons	73.00	6.39
Failed crops	0.07	-	-	-
Output per acre				$15.39

[1] Cropping patterns were derived from the U.S. Census of Agriculture for 1982 and 1987. Data from the two censuses for Imperial and Riverside Counties were averaged, and only those crops representing more than three percent of irrigated acreage were included.

[2] Irrigated yields are from the Agricultural Crop and Livestock Reports by the Agricultural Commissioners of Imperial and Riverside Counties for the years 1989 through 1992. Dryland yields were derived with the help of Gary Foster from the Riverside County Agricultural Commissioners' office.

[3] Crop prices are the average of 1989-1991 prices contained in the Agricultural Price Summary, published annually by the National Agricultural Statistics Services of the USDA.

[4] Weighted output was computed by multiplying each crop's production by its yield and price and summing over all crops. The resulting total is the weighted average output per irrigated acre.

4. Nevada

a. The Colorado River

(1) Recreation

The only recreational impact quantified for the State of Nevada was a loss of 50,000 activity days of fishing annually in Lakes Mead and Mojave. The assumptions and methods employed in arriving at this impact estimate are described in Section B.c of Chapter II-10.

Volume II

Chapter 11: Input-Output State-Level Impacts

A. Introduction

The overall concern being addressed by the economic analysis of actions taken to preserve and recover the endangered species is the economic impacts of these actions. This raises the question of the appropriate means of measuring these economic impacts. The choice of methodologies has been discussed in Chapter II-7. Justification for the use of input-output (I-O) models at the State and regional level and for the use of a regional computable general equilibrium (CGE) model was also presented in these chapters. The issues raised here concern the economic variables to be used to measure the impacts to the State economies.

Direct impacts involve changes in economic activities that are directly affected by changes in the operation of the rivers to address the needs of the endangered species. For example, river flow timing changes will have a direct impact on hydroelectric generation. These direct impacts will then generate indirect impacts through the linkages in the economy that were discussed in Chapter II-7. Thus, direct impacts in the hydroelectric generation will lead to indirect effects in coal and gas (used to produce thermal electric power), manufacturing (electricity is an input), and so on. Since these impacts alter the level of economic activity, the usual means of measuring these overall changes is through the use of national (regional) income and products accounts (NIPA), which provides a comprehensive measurement of economic activity.

Regional economic activity may be measured in terms of aggregate expenditures or aggregate factor incomes. These measures will yield identical results subject to adjustments of the aggregate expenditures to report these at factor cost (through removal of taxes and subsidies).[63] As the level of economic activity changes due to exogenous shocks, the impacts will be registered in the level of real gross regional product (RGRP) and the level of gross regional factor incomes.

The NIPA structure is primarily concerned with the composition of final demand, or regional output. Final demand, Y, is defined as the sum of consumption, C; investment, I; government expenditure, G; and exports, E:

$$Y = C + I + G + E$$

To the extent that market transactions capture all changes in well-being (a much-debated issue), changes in RGRP may be used to evaluate economic impacts associated with exogenous shocks. However, these aggregated measures are incapable of recording sectoral impacts. For example, a fall in the output of one sector that is matched by an increase in another sector will leave total final demand unchanged and will not be recorded as a change in the RGRP. However, this shift may have consequences for a regional economy. I-O accounts explicitly capture these sectoral shifts as well as recording any aggregate final demand changes. Although the dominant concern of the I-O accounts is the inter-industry transactions that lie behind the changes in final demand, the I-O accounts are capable of providing the aggregate responses as well.

Changes in output represent the most comprehensive measure of economic impacts due to exogenous changes. This measure subsumes all other effects such as employment and earnings because the NIPA structure ensures that RGRP = Total Expenditure = Total Factor Incomes. At the aggregate level total expenditure is the sum of total consumption (all households over all goods), total investment (all sectors and includes inventories), total government expenditure, and total exports. Total factor income (also referred to as total value added) is the sum of earnings, return to capital, taxes, and imports. In the following sections various measures of impacts are presented including employment, earnings, and taxes collected. Each measure is derived from the impact in output.

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[63] In actual fact, these measures never quite match due to the presence of statistical discrepancies.

Output changes may be presented at a sectoral level as well as in terms of total output for the State (regional) economy. The sectoral measures are useful since it is possible to identify differential impacts across sectors. There may be instances in which total output does not change but output decreases in some sectors and this is offset by increases in other sectors. The construction of a without fish scenario is based on the presumption that resources are allocated efficiently given the present allocation of property rights. Changes in the allocation of resources (and/or property rights) will alter the output of the economy. The changes in output represent opportunity costs associated with the exogenous changes in the allocation of resources.

In addition to sector-specific impacts there are spatial-specific impacts. To address these, a set of model stages was developed as described in Chapter II-7. These permit State-level impacts to be differentiated from region-level impacts.

1. Specific Measures Used in this Report

Several measures of the impacts (State-level) associated with endangered species are presented in the following sections of this chapter. These measures are defined as follows. Total and sectoral output levels and changes are presented in millions of 1982 dollars. These data report the dollar values of the outputs for each sector in the without fish scenario and the with fish scenario. These changes are calculated by subtracting the with fish values from the without fish values for each year being analyzed. The changes that are reported reflect both direct and indirect impacts in each sector and for the total State economy.

Employment levels are reported for the without fish projections and the with fish projections. These are reported in persons employed by sector and in total.[64] Employment changes lead to earnings (wages and salaries) changes. Earnings are reported by sector and in total for the without fish projections and the with fish projections. As earnings change, so do personal tax payments. Since income tax rates do not vary by economic sector, the personal tax levels are reported for the total economy, not by individual sector. Indirect business tax rates (averages) do vary across economic sector and these are reported by sector and in total. The overall impact on the Federal/State/local governments is obtained by summing the changes in personal and indirect business taxes.

The earnings figures for the agricultural sectors (livestock, other crops, livestock feed, and miscellaneous agriculture) do not capture household income effects entirely. In the IMPLAN data base, earnings in the agricultural sector constitute only wages and salaries paid to hired employees. Earnings by owner-operators are reported under proprietary income. However, part of this proprietary income is the earnings of shareholders in large corporate farming operations. The data to break out the "family farm" figures were not available. The result is that the earnings results reported below understate the impacts in the agricultural sectors.

The study period runs from 1989 through 2020. A given dollar impact that occurs in 2020 is not equivalent to an identical dollar impact in 1995. Specifically, an impact (whether positive or negative) that occurs far into the future is valued less than an identical dollar impact that occurs in the near future.[65] To make these values comparable they must be converted to a common unit known as the present value. A stream of future impacts is converted to a present value through the use of the discount rate. This conversion is carried out through the following expression:

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[64] In most cases, the employment impacts grow over time. Care must be used in interpreting these numbers. A property of the I-O methodology is that labor is projected to grow by sector based on regional projections that do not include endangered species effects. Since these effects occur over a period of time, it is reasonable to expect that employment patterns will change over time as well and fewer persons will attempt to enter declining sectors. Thus, the employment impacts will naturally appear larger over time. This is an overstatement since the without fish figures would not continue to grow as they are projected to grow without endangered fishes.

[65] This difference arises from what Irving Fisher (1930) called the "impatience effect." Individuals prefer current consumption to future consumption and are willing to pay more to enjoy current consumption. To be persuaded to defer consumption until the future, through present saving, an individual must receive more dollars than he or she saved. Thus, banks offer interest on deposits to induce individuals to save. By the same token, individuals who wish to consume in the present are willing to pay a greater price through interest payments for loans.

$$PV(x) = \sum_{i=0,T} \frac{x_t}{(1+r)^t}$$

where r is the discount rate and x is a stream of impacts that occurs over the interval from the current period (denoted 0) to the final period (denoted T). In the present study the current period, 0, is 1993 and the final period, T, is 2020.

In the present study all values are in constant (1982) dollars so the discount rate is referred to as a real discount rate; that is, net of inflation. All of the dollar impacts are converted to present values for comparison purposes. There is some debate concerning the appropriate discount rate to use. In this report present values are reported for discount rates of 0 percent, 3 percent, 5 percent, and 10 percent. Since these are real discount rates, the present values that result from the 3 percent or 5 percent discount rates are the most relevant for evaluating the economic impacts.

In the following sections the State-level impacts are reported for each of the seven States in the Colorado River Basin study area. The direct impacts are reported first and these form the impact scenarios that are investigated through the State-level I-O models. The total impacts (direct plus indirect) are then reported. In all cases the impacts refer to the total effect of endangered species: species listing plus proposed critical habitat. These are presented separately later in this report.

2. The Structure of the Tables

To facilitate interpretation of the data given for each State, a brief description of each of the tables will be presented here. This description applies to all sections in this chapter. The discussion for each State begins with a table (II-11-*-1, * denotes a particular State, eg. AZ) of the direct impacts.[66] This table summarizes the material presented in Chapters II-9 and II-10 for each State.

The first set of tables (denoted as Tables II-11-*-2 and II-11-*-3) report output level figures by sector and by year for the without fish and the with fish scenarios. Changes that are projected to occur under the with fish scenario an the changes in output (by sector and by year) are presented in Table II-11-*-4, and the time stream information is converted to present value for various discount rates in Table II-11-*-5.

Employment effects are reported in Tables II-11-*-6 and II-11-*-7, which give the employment levels for the without fish and with fish results, respectively. Changes in employment by sector and by year are reported in Table II-11-*-8. Table II-11-*-9 reports the incremental employment effects for the five-year intervals that are projected.

Earnings are reported in Tables II-11-*-10 and II-11-*-11 by sector and by year. Changes are reported in Table II-11-*-12, and the cumulative totals for various discount rates are reported in Table II-11-*-13.

Fiscal effects are reported as impacts in indirect business taxes and personal income taxes. The indirect business tax effects are reported in Tables II-11-*-14 and II-11-*-15. The changes data are reported in Table II-11-*-16 by year and in Table II-11-*-17 as a cumulative measure (again at various discount rates). Personal income tax levels are reported in Table II-11-*-18 and II-11-*-19 with the changes personal tax levels are in Tables II-11-*-20 and II-11-*-21.

Finally, Table II-11-*-22 reports a measure of economic impacts in terms of the cumulative deviation between the with fish and without fish scenarios. This cumulative deviation is converted to a present value. The measure in the table is this value as a percent of the present value of the without fish projections through the study period. This measure is reported for each of the key macroeconomic variables.

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[66] The structure is Volume #-Chapter #-Section letter-Table or Figure #.

B. Arizona State Impacts

1. Direct Impacts

The direct impacts for Arizona associated with implementing the requirements of the endangered fishes were described in detail by river basin in Chapter II-10. Table II-11-AZ-1 reports the overall State-level direct impacts. Negative direct impacts are projected to occur in the recreation services sector through the study period and in the electric power sector in the early and late parts of the study period.

Table II-11-AZ-1. Direct Impacts for Arizona.
(Listing and Critical Habitat)
(1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Recreation	0.000	-0.250	-0.500	-0.750	-1.000	-1.250
Electric Power	-1.474	-0.078	0.634	0.374	-0.867	-0.410
TOTAL	-1.474	-0.328	0.134	-0.386	-1.867	-1.660

Over the study period, the total direct impacts are negative in all model years except 2005.

2. Output (Direct and Indirect) Effects

a. Aggregate Output

Aggregate output is lower throughout the study period under the with fish scenario (see Tables II-11-AZ-2 and II-11-AZ-3). In 1995 the difference is -$1.8 million and this figure grows more or less steadily through 2020 when it reaches -$7.4 million. This latter value represents a 0.007 percent decline in aggregate output from the without fish scenario. The cumulative total for the aggregate losses over the study period is -$96.7 million (see Table

II-11-AZ-5), which has a present value of -$52.1 million at a 3 percent discount rate or -$36.1 million at a 5 percent discount rate.

b. Sectoral Output Impacts

The discussion of the sectoral output impacts in the Arizona economy begins with those sectors projected to face direct impacts as a result of the actions taken on behalf of the endangered species. Selected sectors experiencing indirect impacts are then discussed.

(1) Recreation Services

Negative impacts in output are projected for the recreation services sector. These losses are projected to increase steadily over the study period and to reach -$4.0 million by 2020. The losses in 2020 represent 0.04 percent of the projected output in this sector under the without fish scenario. The present value of the cumulative impacts is -$18.5 million (Table II-11-AZ-6).

(2) Electric Power

The hydroelectric generation effects induced by endangered species actions are projected to produce negative impacts in the production of electric power throughout the study period (see Table II-11-AZ-4). These overall impacts reach -$2.1 million by 2020. Cumulative losses over the study period are $40 million, which have a present value of $24 million at 3 percent (see Table II-11-AZ-5).

(3) Purely Indirect Impacts

There are no direct impacts projected for the transportation, communication, and utilities sector. However, as a result of the direct impacts in recreation and in electric power, this sector is projected to generate negative impacts throughout the study period. The largest of these losses arises in 2020 (-$0.3 million). There are also indirect impacts in the wholesale and retail trade sector and in the finance, insurance, and real estate sector (see Table II-11-AZ-4).

3. Employment Impacts

a. Aggregate Employment Impacts

Aggregate employment is lower under the with fish scenario than the without fish measures. In 1995 there are 13 foregone jobs and this number grows over the study period until it reaches 160 foregone jobs in 2020 (see Table II-11-AZ-8). Incremental losses are presented by five-year interval in Table II-11-AZ-9. In each period the foregone jobs increase. In part, this is due to the increasing influence of the direct impacts. However, for reasons discussed elsewhere in this chapter, these projections of employment effects must be regarded as an overstatement of the likely impacts.

b. Sectoral Employment Impacts

(1) Recreation Services

The number of jobs in this sector is projected to be below the without fish levels throughout the study period. By 2020 the employment is projected to be 128 jobs below the level projected in the without fish scenario (Table II-11-AZ-8).

(2) Electric Power

Employment in this sector is projected to fall relative to the level in the without fish scenario. In 1995, projections suggest there will be 9 foregone jobs in this sector. The level of negative impacts on jobs in this sector remains fairly constant throughout the study period (see Table II-11-AZ-8).

4. Earnings Impacts

a. Aggregate Earnings

Projected earnings are lower under the with fish scenario than under the without fish scenario. This difference is -$0.4 million in 1995 and rises to -$2.3 million by 2020. Table II-11-AZ-12 reports the changes in the level of earnings that are due to actions taken in the with fish scenario.

b. Sectoral Earnings

(1) Recreation Services

Earnings are projected to be lower throughout the study period in the with fish scenario. The cumulative total impact on earnings (see Table II-11-AZ-13) in this sector over the course of the study period is -$14.5 million (-$6.9 million present value at a 3 percent discount rate).

(2) Electric Power

Inspection of Table II-11-AZ-12 reveals that earnings also are projected to be lower in this sector as well. In 2000 the difference between the without fish projection and the with fish projection is -$0.3 million. Over the study period, total earnings in this sectors are projected to be $6.4 million lower in the with fish projection (the present value of the stream of differences is -$3.8 million at a 3 percent discount rate).

5. Fiscal Effects

Indirect business taxes are projected to decline under the with fish scenario. Table II-11-AZ-16 reports the tax collections changes by year and sector. There is a negative impact in the indirect business taxes for each of the years of the study period and these impacts reach -$0.4 million by 2020. The cumulative negative impact to all levels of government from this revenue source is -$4.6 million over the study period. At 3 percent the present value of these losses is -$2.4 million and at 5 percent, -$1.7 million.

Personal income taxes are also projected to decline in the with fish scenario. These losses reach -$0.6 million by 2020 (see Table II-11-AZ-19). Total fiscal impacts are 1.0 million by 2020 and the cumulative negative impacts to governments amount to -$11.5 million.

6. Summary

Overall, the impact of endangered species on the Arizona economy is negative (see Table II-11-AZ-19). The reduction in aggregate output is 0.026 percent below the projected level in the absence of fish impacts measured as the percentage deviation between the present values. The impact in specific sectors is somewhat larger. In the recreation sector, for example, the losses by 2020 are projected to be 0.04 percent of the without fish projected level of output.

Table II-11-AZ-2. Arizona: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	989.3	975.5	955.9	920.2	889.6	858.0	821.1
Other Crops	1211.6	1202.9	1177.5	1139.1	1104.4	1064.2	1018.4
Livestock Feed	328.9	327.5	319.0	309.9	299.5	288.6	276.2
Misc. Agriculture	343.0	370.9	400.5	431.7	453.4	468.4	479.5
Non-petroleum Mines	1645.7	1627.5	1628.1	1608.9	1581.8	1542.2	1466.7
Petroleum & Gas Production	4.8	4.6	4.6	4.4	4.3	4.2	4.1
New Construction	7241.2	7761.2	8287.4	8637.9	8846.1	8985.0	8909.5
Combined Manufacturing	19189.9	20205.1	20849.6	21202.0	21356.7	21134.6	20718.3
Food Products	1167.1	1190.7	1203.7	1212.7	1196.0	1167.8	1124.1
Wood Products	1765.4	1930.6	2034.5	2101.2	2136.5	2135.3	2119.5
Petroleum & Coal Products	365.3	361.8	363.0	358.4	352.7	347.0	339.4
Transp, Comm, & Utilities	3749.4	4045.3	4305.8	4443.1	4552.0	4631.6	4664.1
Recreation Services	7184.0	7952.7	8676.4	9328.8	9771.0	10081.7	10301.5
Electric Power Production	3596.1	3932.7	4201.3	4354.7	4442.6	4482.2	4431.5
Wholesale/Retail Trade	5648.0	6196.4	6720.0	7076.8	7288.4	7433.4	7507.8
Finance, Insurance, Real Estate	13359.1	14588.1	15653.0	16398.1	16896.6	17150.1	17155.2
Household and Business Services	7162.4	7819.2	8472.1	8932.1	9226.0	9511.0	9800.2
Local Amusements	535.4	585.2	628.5	659.3	677.8	690.6	689.1
Health, Education, Social Services	5023.1	5560.6	6077.7	6448.4	6661.2	6761.1	6781.4
Government Industries	7991.2	8494.6	8834.4	9037.6	9308.7	9355.3	9551.7
TOTAL	88501.0	95133.0	100792.9	104605.5	107045.4	108092.5	108159.4

Table II-11-AZ-3. Arizona: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	989.3	975.5	955.9	920.2	889.6	858.0	821.1
Other Crops	1211.6	1202.9	1177.5	1139.1	1104.4	1064.2	1018.4
Livestock Feed	328.9	327.5	319.0	309.8	299.5	288.6	276.2
Misc. Agriculture	343.0	370.9	400.5	431.7	453.4	468.4	479.5
Non-petroleum Mines	1645.7	1627.5	1628.1	1608.9	1581.8	1542.2	1466.6
Petroleum & Gas Production	4.8	4.6	4.5	4.4	4.3	4.2	4.1
New Construction	7241.2	7761.1	8287.3	8637.9	8846.0	8984.9	8909.4
Combined Manufacturing	19189.9	20205.0	20849.6	21201.9	21356.7	21134.6	20718.2
Food Products	1167.1	1190.7	1203.7	1212.7	1195.9	1167.7	1123.9
Wood Products	1765.4	1930.6	2034.5	2101.2	2136.5	2135.2	2119.4
Petroleum & Coal Products	365.3	361.8	363.0	358.4	352.6	347.0	339.4
Transp, Comm, & Utilities	3749.4	4045.1	4305.6	4443.0	4551.9	4631.4	4663.8
Recreation Services	7184.0	7952.7	8676.1	9328.0	9769.4	10079.1	10297.5
Electric Power Production	3596.1	3931.2	4199.7	4353.6	4441.9	4480.5	4429.5
Wholesale/Retail Trade	5648.0	6196.4	6720.0	7076.8	7288.4	7433.4	7507.8
Finance, Insurance, Real Estate	13359.1	14588.1	15653.0	16398.1	16896.5	17149.9	17155.0
Household and Business Services	7162.4	7819.1	8472.0	8932.0	9225.9	9510.9	9800.0
Local Amusements	535.4	585.2	628.5	659.3	677.8	690.6	689.1
Health, Education, Social Services	5023.1	5560.6	6077.7	6448.4	6661.2	6761.1	6781.4
Government Industries	7991.2	8494.6	8834.4	9037.6	9308.7	9355.2	9551.7
TOTAL	88501.0	95131.1	100790.5	104603.2	107042.6	108087.2	108152.0

Table II-11-AZ-4. Arizona. Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Food Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Transp, Comm, & Utilities	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3
Recreation Services	0.0	0.0	-0.3	-0.8	-1.6	-2.7	-4.0
Electric Power Production	0.0	-1.5	-1.7	-1.1	-0.8	-1.6	-2.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Household and Business Services	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-1.8	-2.4	-2.3	-2.9	-5.3	-7.4

Table II-11-AZ-5. Arizona: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

		Direct and Indirect Impact			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		-0.5	-0.2	-0.1	0.0
Other Crops		-0.2	-0.1	0.0	0.0
Livestock Feed		-0.1	0.0	0.0	0.0
Misc. Agriculture		-0.1	0.0	0.0	0.0
Non-petroleum Mines		-0.9	-0.5	-0.4	-0.2
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		-2.6	-1.5	-1.1	-0.6
Combined Manufacturing		-1.0	-0.6	-0.4	-0.2
Food Products		-1.4	-0.7	-0.4	-0.1
Wood Products		-0.6	-0.3	-0.2	-0.1
Petroleum & Coal Products		-0.9	-0.5	-0.4	-0.2
Transp, Comm, & Utilities		-4.3	-2.4	-1.7	-0.9
Recreation Services		-38.7	-18.5	-11.6	-3.9
Electric Power Production		-40.1	-24.0	-17.8	-9.6
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		-2.2	-1.1	-0.7	-0.3
Household and Business Services		-2.4	-1.2	-0.8	-0.3
Local Amusements		-0.2	-0.1	-0.1	0.0
Health, Education, Social Services		-0.1	-0.1	0.0	0.0
Government Industries		-0.4	-0.2	-0.2	-0.1
TOTAL		-96.7	-52.1	-36.1	-16.7

Table II-11-AZ-6. Arizona: Employment - Without Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	10912.9	10498.2	10256.7	9961.3	9648.5	9306.0	8905.9
Other Crops	20711.8	19924.8	19466.5	18905.9	18312.2	17662.1	16902.7
Livestock Feed	3282.5	3157.8	3085.2	2996.3	2902.2	2799.2	2678.8
Misc. Agriculture	19105.8	20634.3	22285.0	24021.0	25202.9	26034.5	26654.2
Non-petroleum Mines	22110.1	21670.1	21657.1	21401.5	21061.2	20534.7	19528.5
Petroleum & Gas Production	9.0	8.6	8.4	8.3	8.1	7.9	7.7
New Construction	73265.2	78525.6	83849.7	87396.5	89502.8	90908.0	90144.3
Combined Manufacturing	210370.1	221498.6	228564.4	232427.2	234123.9	231689.0	227124.7
Food Products	15629.8	15945.5	16119.3	16240.2	16016.1	15638.1	15053.2
Wood Products	29455.6	32212.7	33945.7	35059.1	35648.1	35626.8	35363.1
Petroleum & Coal Products	554.8	549.6	551.4	544.4	535.7	527.1	515.6
Transp, Comm, & Utilities	53766.7	58008.9	61744.7	63714.3	65275.3	66417.7	66882.6
Recreation Services	229287.2	253820.9	276918.6	297742.9	311855.9	321772.9	328787.5
Electric Power Production	19413.3	21230.4	22680.4	23508.3	23983.1	24196.6	23923.2
Wholesale/Retail Trade	304880.8	334484.7	362748.6	382010.6	393432.7	401262.0	405274.6
Finance, Insurance, Real Estate	94964.6	103701.4	111271.6	116568.1	120111.8	121913.5	121950.1
Household and Business Services	159802.5	174456.4	189023.5	199287.5	205844.1	212204.6	218655.7
Local Amusements	22788.9	24908.3	26751.5	28062.4	28848.1	29396.2	29331.5
Health, Education, Social Services	125198.3	138594.5	151483.7	160724.3	166028.2	168518.6	169024.1
Government Industries	390785.7	415405.2	432021.4	441957.9	455216.7	457492.7	467100.1
TOTAL	1806295.6	1949236.4	2074433.5	2162537.9	2223557.5	2253908.2	2273808.1

Table II-11-AZ-7. Arizona: Employment - With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	10912.9	10498.2	10256.7	9961.2	9648.3	9305.7	8905.4
Other Crops	20711.8	19924.8	19466.5	18905.8	18312.1	17661.9	16902.4
Livestock Feed	3282.5	3157.8	3085.2	2996.3	2902.2	2799.2	2678.8
Misc. Agriculture	19105.8	20634.2	22285.0	24020.9	25202.7	26034.3	26653.8
Non-petroleum Mines	22110.1	21669.6	21656.6	21401.2	21061.0	20534.2	19527.9
Petroleum & Gas Production	9.0	8.6	8.4	8.3	8.1	7.9	7.7
New Construction	73265.2	78524.8	83848.7	87395.8	89502.1	90906.7	90142.7
Combined Manufacturing	210370.1	221498.4	228564.1	232426.9	234123.6	231688.4	227123.9
Food Products	15629.8	15945.5	16119.2	16239.8	16015.3	15636.8	15051.3
Wood Products	29455.6	32212.6	33945.6	35058.9	35647.8	35626.2	35362.3
Petroleum & Coal Products	554.8	549.6	551.3	544.3	535.6	527.1	515.5
Transp, Comm, & Utilities	53766.7	58007.2	61742.7	63712.8	65273.9	66414.7	66878.6
Recreation Services	229287.2	253820.6	276910.1	297717.5	311804.9	321687.5	328659.4
Electric Power Production	19413.3	21222.4	22671.5	23502.4	23979.1	24187.7	23912.0
Wholesale/Retail Trade	304880.8	334484.7	362748.6	382010.6	393432.7	401261.9	405274.5
Finance, Insurance, Real Estate	94964.6	103701.3	111271.4	116567.8	120111.2	121912.5	121948.6
Household and Business Services	159802.5	174455.9	189022.6	199286.3	205842.2	212201.3	218650.8
Local Amusements	22788.9	24908.3	26751.4	28062.2	28847.9	29395.8	29331.0
Health, Education, Social Services	125198.3	138594.4	151483.7	160724.2	166028.1	168518.4	169023.9
Government Industries	390785.7	415404.7	432020.8	441957.4	455216.1	457491.6	467098.5
TOTAL	1806295.6	1949223.4	2074410.0	2162500.6	2223494.8	2253799.9	2273648.9

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Table II-11-AZ-8. Arizona: Employment - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Other Crops	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Misc. Agriculture	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Non-petroleum Mines	0.0	-0.5	-0.5	-0.3	-0.2	-0.5	-0.6
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	-0.8	-0.9	-0.7	-0.6	-1.2	-1.6
Combined Manufacturing	0.0	-0.2	-0.3	-0.3	-0.3	-0.6	-0.8
Food Products	0.0	0.0	-0.1	-0.4	-0.8	-1.3	-1.9
Wood Products	0.0	-0.1	-0.1	-0.2	-0.3	-0.6	-0.9
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Transp, Comm, & Utilities	0.0	-1.7	-2.0	-1.5	-1.5	-2.9	-4.0
Recreation Services	0.0	-0.3	-8.5	-25.3	-50.9	-85.4	-128.1
Electric Power Production	0.0	-8.0	-9.0	-5.9	-4.1	-8.9	-11.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Finance, Insurance, Real Estate	0.0	-0.1	-0.2	-0.4	-0.6	-1.0	-1.4
Household and Business Services	0.0	-0.6	-0.9	-1.2	-1.9	-3.3	-4.9
Local Amusements	0.0	-0.1	-0.1	-0.1	-0.2	-0.4	-0.6
Health, Education, Social Services	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.3
Government Industries	0.0	-0.5	-0.6	-0.5	-0.6	-1.1	-1.6
TOTAL	0.0	-12.9	-23.5	-37.3	-62.7	-108.3	-159.1

Table II-11-AZ-9. Arizona: Change in Jobs Available
(Listing and Critical Habitat)
(Number of Jobs)

CHANGE OF NUMBER OF JOBS AVAILABLE FOR FIVE INCREMENTAL YEARS

INDUSTRIAL SECTORS	1989-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	TOTAL
Livestock	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.5
Other Crops	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.3
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Misc. Agriculture	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.3
Non-petroleum Mines	-0.5	0.0	0.2	0.1	-0.3	-0.1	-0.6
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	-0.8	-0.1	0.2	0.1	-0.6	-0.4	-1.6
Combined Manufacturing	-0.2	-0.1	0.0	0.0	-0.3	-0.2	-0.8
Food Products	0.0	-0.1	-0.3	-0.4	-0.5	-0.6	-1.9
Wood Products	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3	-0.9
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Transp, Comm, & Utilities	-1.7	-0.3	0.4	0.1	-1.5	-1.0	-4.0
Recreation Services	-0.3	-8.2	-16.8	-25.6	-34.4	-42.8	-128.1
Electric Power Production	-8.0	-1.0	3.1	1.8	-4.8	-2.2	-11.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Finance, Insurance, Real Estate	-0.1	-0.1	-0.1	-0.2	-0.4	-0.4	-1.4
Household and Business Services	-0.6	-0.3	-0.3	-0.7	-1.4	-1.6	-4.9
Local Amusements	-0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.6
Health, Education, Social Services	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.3
Government Industries	-0.5	-0.1	0.1	-0.1	-0.5	-0.5	-1.6
TOTAL	-12.9	-10.6	-13.8	-25.4	-45.7	-50.8	-159.1

Table II-11-AZ-10. Arizona: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	95.1	93.8	91.9	88.4	85.5	82.5	78.9
Other Crops	224.4	222.7	218.0	210.9	204.5	197.1	188.6
Livestock Feed	15.5	15.4	15.0	14.6	14.1	13.6	13.0
Misc. Agriculture	144.1	155.7	168.2	181.3	190.4	196.7	201.4
Non-petroleum Mines	1084.0	1072.0	1072.4	1059.7	1041.9	1015.8	966.0
Petroleum & Gas Production	0.4	0.4	0.4	0.4	0.4	0.4	0.4
New Construction	2784.3	2984.2	3186.6	3321.4	3401.4	3454.8	3425.8
Combined Manufacturing	8483.1	8931.8	9216.7	9372.5	9440.9	9342.7	9158.7
Food Products	281.4	287.0	290.2	292.3	288.3	281.5	271.0
Wood Products	656.8	718.3	756.9	781.7	794.9	794.4	788.5
Petroleum & Coal Products	22.0	21.8	21.9	21.6	21.2	20.9	20.4
Transp, Comm, & Utilities	1542.0	1663.7	1770.8	1827.3	1872.1	1904.8	1918.2
Recreation Services	2688.2	2975.8	3246.6	3490.8	3656.2	3772.5	3854.7
Electric Power Production	575.2	629.0	672.0	696.5	710.6	716.9	708.8
Wholesale/Retail Trade	3135.8	3440.3	3731.0	3929.1	4046.6	4127.1	4168.3
Finance, Insurance, Real Estate	2175.6	2375.8	2549.2	2670.6	2751.8	2793.0	2793.9
Household and Business Services	3335.0	3640.8	3944.8	4159.0	4295.8	4428.6	4563.2
Local Amusements	227.0	248.1	266.5	279.6	287.4	292.8	292.2
Health, Education, Social Services	3031.7	3356.1	3668.2	3892.0	4020.4	4080.7	4092.9
Government Industries	7740.5	8228.2	8557.3	8754.1	9016.7	9061.8	9252.1
TOTAL	38242.0	41061.0	43444.6	45043.8	46141.1	46578.7	46757.1

Table II-11-AZ-11. Arizona: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	95.1	93.8	91.9	88.4	85.5	82.5	78.9
Other Crops	224.4	222.7	218.0	210.9	204.5	197.1	188.6
Livestock Feed	15.5	15.4	15.0	14.6	14.1	13.6	13.0
Misc. Agriculture	144.1	155.7	168.2	181.3	190.4	196.7	201.4
Non-petroleum Mines	1084.0	1071.9	1072.4	1059.7	1041.8	1015.8	966.0
Petroleum & Gas Production	0.4	0.4	0.4	0.4	0.4	0.4	0.4
New Construction	2784.3	2984.2	3186.5	3321.3	3401.4	3454.8	3425.7
Combined Manufacturing	8483.1	8931.8	9216.7	9372.5	9440.9	9342.7	9158.7
Food Products	281.4	287.0	290.2	292.3	288.3	281.5	270.9
Wood Products	656.8	718.3	756.9	781.7	794.9	794.4	788.5
Petroleum & Coal Products	22.0	21.8	21.9	21.6	21.2	20.9	20.4
Transp, Comm, & Utilities	1542.0	1663.6	1770.8	1827.3	1872.0	1904.8	1918.1
Recreation Services	2688.2	2975.8	3246.5	3490.5	3655.6	3771.5	3853.2
Electric Power Production	575.2	628.8	671.7	696.4	710.5	716.7	708.5
Wholesale/Retail Trade	3135.8	3440.3	3731.0	3929.1	4046.6	4127.1	4168.3
Finance, Insurance, Real Estate	2175.6	2375.8	2549.2	2670.6	2751.7	2793.0	2793.8
Household and Business Services	3335.0	3640.8	3944.8	4159.0	4295.8	4428.5	4563.1
Local Amusements	227.0	248.1	266.5	279.6	287.4	292.8	292.2
Health, Education, Social Services	3031.7	3356.1	3668.2	3892.0	4020.4	4080.7	4092.9
Government Industries	7740.5	8228.1	8557.3	8754.1	9016.7	9061.8	9252.1
TOTAL	38242.0	41060.6	43444.1	45043.2	46140.2	46577.1	46754.8

Table II-11-AZ-12. Arizona: Earnings - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1
Recreation Services	0.0	0.0	-0.1	-0.3	-0.6	-1.0	-1.5
Electric Power Production	0.0	-0.2	-0.3	-0.2	-0.1	-0.3	-0.3
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.4	-0.5	-0.6	-0.9	-1.6	-2.3

Table II-11-AZ-13. Arizona: Earnings - Present Values of Differences by Sector
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		-0.6	-0.4	-0.3	-0.1
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		-1.0	-0.6	-0.4	-0.2
Combined Manufacturing		-0.4	-0.2	-0.2	-0.1
Food Products		-0.3	-0.2	-0.1	0.0
Wood Products		-0.2	-0.1	-0.1	0.0
Petroleum & Coal Products		-0.1	0.0	0.0	0.0
Transp, Comm, & Utilities		-1.7	-1.0	-0.7	-0.4
Recreation Services		-14.5	-6.9	-4.3	-1.5
Electric Power Production		-6.4	-3.8	-2.9	-1.5
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.4	-0.2	-0.1	0.0
Household and Business Services		-1.1	-0.6	-0.4	-0.2
Local Amusements		-0.1	0.0	0.0	0.0
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-0.4	-0.2	-0.2	-0.1
TOTAL		-27.5	-14.3	-9.7	-4.2

Table II-11-AZ-14. Arizona: Indirect Business Tax - Without Fish Impacts (Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	30.7	30.3	29.7	28.6	27.6	26.6	25.5
Other Crops	21.4	21.2	20.8	20.1	19.5	18.8	17.9
Livestock Feed	8.9	8.8	8.6	8.4	8.1	7.8	7.5
Misc. Agriculture	8.2	8.9	9.6	10.4	10.9	11.2	11.5
Non-petroleum Mines	100.3	99.2	99.2	98.1	96.4	94.0	89.4
Petroleum & Gas Production	0.7	0.7	0.6	0.6	0.6	0.6	0.6
New Construction	100.4	107.6	114.9	119.8	122.7	124.6	123.6
Combined Manufacturing	277.4	292.1	301.4	306.5	308.7	305.5	299.5
Food Products	14.9	15.2	15.3	15.5	15.2	14.9	14.3
Wood Products	27.6	30.1	31.8	32.8	33.3	33.3	33.1
Petroleum & Coal Products	9.9	9.8	9.9	9.7	9.6	9.4	9.2
Transp, Comm, & Utilities	217.8	235.0	250.2	258.1	264.5	269.1	271.0
Recreation Services	405.4	448.7	489.6	526.4	551.3	568.9	581.3
Electric Power Production	141.5	154.8	165.3	171.4	174.8	176.4	174.4
Wholesale/Retail Trade	1002.8	1100.1	1193.1	1256.5	1294.0	1319.8	1333.0
Finance, Insurance, Real Estate	2074.8	2265.7	2431.1	2546.8	2624.2	2663.6	2664.4
Household and Business Services	103.1	112.5	121.9	128.5	132.8	136.9	141.0
Local Amusements	56.9	62.2	66.8	70.1	72.0	73.4	73.2
Health, Education, Social Services	16.2	18.0	19.6	20.8	21.5	21.8	21.9
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4618.9	5021.0	5379.5	5629.0	5787.9	5876.7	5892.3

Table II-11-AZ-15. Arizona: Indirect Business Tax - With Fish Impacts (Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	30.7	30.3	29.7	28.6	27.6	26.6	25.5
Other Crops	21.4	21.2	20.8	20.1	19.5	18.8	17.9
Livestock Feed	8.9	8.8	8.6	8.4	8.1	7.8	7.5
Misc. Agriculture	8.2	8.9	9.6	10.4	10.9	11.2	11.5
Non-petroleum Mines	100.3	99.2	99.2	98.1	96.4	94.0	89.4
Petroleum & Gas Production	0.7	0.7	0.6	0.6	0.6	0.6	0.6
New Construction	100.4	107.6	114.9	119.8	122.7	124.6	123.6
Combined Manufacturing	277.4	292.1	301.4	306.5	308.7	305.5	299.5
Food Products	14.9	15.2	15.3	15.5	15.2	14.9	14.3
Wood Products	27.6	30.1	31.8	32.8	33.3	33.3	33.1
Petroleum & Coal Products	9.9	9.8	9.9	9.7	9.6	9.4	9.2
Transp, Comm, & Utilities	217.8	235.0	250.2	258.1	264.5	269.1	271.0
Recreation Services	405.4	448.7	489.6	526.3	551.2	568.7	581.0
Electric Power Production	141.5	154.7	165.3	171.3	174.8	176.3	174.3
Wholesale/Retail Trade	1002.8	1100.1	1193.1	1256.5	1294.0	1319.8	1333.0
Finance, Insurance, Real Estate	2074.8	2265.7	2431.1	2546.8	2624.2	2663.6	2664.4
Household and Business Services	103.1	112.5	121.9	128.5	132.8	136.9	141.0
Local Amusements	56.9	62.2	66.8	70.1	72.0	73.4	73.2
Health, Education, Social Services	16.2	18.0	19.6	20.8	21.5	21.8	21.9
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4618.9	5020.9	5379.4	5628.9	5787.8	5876.4	5891.9

Table II-11-AZ-16. Arizona: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2
Electric Power Production	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.1	-0.1	-0.1	-0.1	-0.3	-0.4

Table II-11-AZ-17. Arizona: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		-0.1	0.0	0.0	0.0
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		0.0	0.0	0.0	0.0
Combined Manufacturing		0.0	0.0	0.0	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		-0.2	-0.1	-0.1	-0.1
Recreation Services		-2.2	-1.0	-0.7	-0.2
Electric Power Production		-1.6	-0.9	-0.7	-0.4
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.3	-0.2	-0.1	0.0
Household and Business Services		0.0	0.0	0.0	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-4.6	-2.4	-1.7	-0.7

Table II-11-AZ-18. Arizona: Personal Income Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	23.8	23.4	23.0	22.1	21.4	20.6	19.7
Other Crops	56.1	55.7	54.5	52.7	51.1	49.3	47.1
Livestock Feed	3.9	3.9	3.8	3.7	3.5	3.4	3.3
Misc. Agriculture	36.0	38.9	42.0	45.3	47.6	49.2	50.3
Non-petroleum Mines	271.0	268.0	268.1	264.9	260.5	254.0	241.5
Petroleum & Gas Production	0.1	0.1	0.1	0.1	0.1	0.1	0.1
New Construction	696.1	746.1	796.6	830.3	850.4	863.7	856.4
Combined Manufacturing	2120.8	2233.0	2304.2	2343.1	2360.2	2335.7	2289.7
Food Products	70.3	71.8	72.5	73.1	72.1	70.4	67.7
Wood Products	164.2	179.6	189.2	195.4	198.7	198.6	197.1
Petroleum & Coal Products	5.5	5.4	5.5	5.4	5.3	5.2	5.1
Transp. Comm. & Utilities	385.5	415.9	442.7	456.8	468.0	476.2	479.5
Recreation Services	672.0	744.0	811.7	872.7	914.1	943.1	963.7
Electric Power Production	143.8	157.3	168.0	174.1	177.6	179.2	177.2
Wholesale/Retail Trade	783.9	860.1	932.7	982.3	1011.6	1031.8	1042.1
Finance, Insurance, Real Estate	543.9	593.9	637.3	667.6	687.9	698.3	698.5
Household and Business Services	833.7	910.2	986.2	1039.8	1074.0	1107.1	1140.8
Local Amusements	56.8	62.0	66.6	69.9	71.8	73.2	73.0
Health, Education, Social Services	757.9	839.0	917.1	973.0	1005.1	1020.2	1023.2
Government Industries	1935.1	2057.0	2139.3	2188.5	2254.2	2265.5	2313.0
TOTAL	9560.5	10265.2	10861.2	11261.0	11535.3	11644.7	11689.3

Table II-11-AZ-19. Arizona: Personal Income Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	23.8	23.4	23.0	22.1	21.4	20.6	19.7
Other Crops	56.1	55.7	54.5	52.7	51.1	49.3	47.1
Livestock Feed	3.9	3.9	3.8	3.7	3.5	3.4	3.3
Misc. Agriculture	36.0	38.9	42.0	45.3	47.6	49.2	50.3
Non-petroleum Mines	271.0	268.0	268.1	264.9	260.5	253.9	241.5
Petroleum & Gas Production	0.1	0.1	0.1	0.1	0.1	0.1	0.1
New Construction	696.1	746.1	796.6	830.3	850.3	863.7	856.4
Combined Manufacturing	2120.8	2233.0	2304.2	2343.1	2360.2	2335.7	2289.7
Food Products	70.3	71.8	72.5	73.1	72.1	70.4	67.7
Wood Products	164.2	179.6	189.2	195.4	198.7	198.6	197.1
Petroleum & Coal Products	5.5	5.4	5.5	5.4	5.3	5.2	5.1
Transp. Comm. & Utilities	385.5	415.9	442.7	456.8	468.0	476.2	479.5
Recreation Services	672.0	744.0	811.6	872.6	913.9	942.9	963.3
Electric Power Production	143.8	157.2	167.9	174.1	177.6	179.2	177.1
Wholesale/Retail Trade	783.9	860.1	932.7	982.3	1011.6	1031.8	1042.1
Finance, Insurance, Real Estate	543.9	593.9	637.3	667.6	687.9	698.3	698.5
Household and Business Services	833.7	910.2	986.2	1039.7	1073.9	1107.1	1140.8
Local Amusements	56.8	62.0	66.6	69.9	71.8	73.2	73.0
Health, Education, Social Services	757.9	839.0	917.0	973.0	1005.1	1020.2	1023.2
Government Industries	1935.1	2057.0	2139.3	2188.5	2254.2	2265.4	2313.0
TOTAL	9560.5	10265.1	10861.0	11260.8	11535.0	11644.3	11688.7

Table II-11-AZ-20. Arizona: Personal Income Tax - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	0.0	0.0	-0.1	-0.1	-0.3	-0.4
Electric Power Production	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.1	-0.1	-0.2	-0.2	-0.4	-0.6

Table II-11-AZ-21. Arizona: Personal Income Tax - Present Values of Differences by Sector
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		-0.1	-0.1	-0.1	0.0
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		-0.3	-0.1	-0.1	-0.1
Combined Manufacturing		-0.1	-0.1	0.0	0.0
Food Products		-0.1	0.0	0.0	0.0
Wood Products		-0.1	0.0	0.0	0.0
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		-0.4	-0.2	-0.2	-0.1
Recreation Services		-3.6	-1.7	-1.1	-0.4
Electric Power Production		-1.6	-1.0	-0.7	-0.4
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.1	0.0	0.0	0.0
Household and Business Services		-0.3	-0.1	-0.1	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.1	-0.1	0.0	0.0
TOTAL		-6.9	-3.6	-2.4	-1.1

Table II-11-AZ-22. Arizona: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

	Total Effects			
Discount Rates	0.00	0.03	0.05	0.10
Output	-0.0030	-0.0026	-0.0023	-0.0018
Earnings	-0.0020	-0.0016	-0.0014	-0.0011
Indirect Business Taxes	-0.0026	-0.0022	-0.0020	-0.0015
Personal Income Taxes	-0.0020	-0.0016	-0.0014	-0.0011

C. California State Impacts

1. Direct Impacts

The direct impacts for the California economy from actions taken on behalf of the endangered fishes were described in Chapter II-10. Table II-11-CA-1 reports the overall State-level impacts. All of the direct impacts for California are projected to occur in the agricultural sectors (specifically livestock feed and other crops) and these are all projected to be positive.

Table II-11-CA-1. Direct Impacts for California
(Listing and Critical Habitat)
(1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Other Crops	6.555	13.619	29.131	38.745	55.860	72.829
Livestock Feed	1.239	2.575	5.508	7.325	10.561	13.769
TOTAL	7.794	16.194	34.639	46.070	66.421	86.598

The total direct impacts are increasing over the entire study period. By 2020 the direct impact in the other crops sector is projected to amount to 0.8 percent of the baseline output.

2. Output (Direct and Indirect) Impacts

a. Aggregate Impacts

The output levels in the without fish and the with fish projections are reported in Tables II-11-CA-2 and II-11-CA-3, respectively. Total output is greater in the with fish scenario (Table II-11-CA-4). In 1995 total State output is $11.7 million greater in the with fish scenario than the without fish scenario. By 2020 the difference is $369 million. Over the study period the cumulative difference is a positive $3,817.0 million. The present value of the output increase is $1,862.5 million (Table II-11-CA-5).

b. Sectoral Impacts

(1) Other Crops

Total output in this sector is projected to be above the without fish level throughout the study period. In 1995 the difference is $6.6 million. By 2020 the difference has grown to $205 million. This represents a 2.35 percent increase over the without fish level.

(2) Livestock Feed

The direct impacts are smaller in this sector than in the other crops sector and this translates into smaller total impacts. Output impacts are a positive $39 million by 2020 (Table II-11-CA-4).

(3) Purely Indirect Effects

Direct impacts are zero in the miscellaneous agriculture sector. Linkages with the sectors that are directly impacted by the endangered species actions lead to indirect effects in this sector. Over the study period, the cumulative positive impacts to the output in this sector are $192.9 million (Table II-11-CA-5). At a 3 percent discount rate, the present value of this output increase is $93.7 million.

The petroleum and coal products sector also is projected to have positive impacts in output so that the total output is greater than in the baseline output by $18 million in 2020. This increase reflects the use of petroleum products in agriculture as well as some induced effects through the general expansion of the State economy. Combined manufacturing also benefits from the expansion in agriculture as output is projected to be above the without fish level throughout the study period. By 2020 this impact is a positive $11 million in output (see Table II-11-CA-5).

3. Employment Impacts

a. Aggregate Impacts

Total employment in California is projected to increase by 265 jobs in 1995 as a result of the impacts due to the endangered species. The employment effects increase over time until the positive impact is projected to be 8,300 jobs by 2020 (Table II-11-CA-8).

b. Sectoral Impacts

(1) Other Crops

Employment is projected to increase in this sector (see Table II-11-CA-8) so that the with fish employment level is greater than the without fish level by 6,105 jobs in 2020. This represents approximately two-thirds of the aggregate employment impacts for the California economy by 2020.

(2) Livestock Feed

By 2020 the total number of jobs in this sector is projected to be greater than the baseline by 368 jobs as a result of the impacts due to endangered fishes.

4. Earnings Impacts

a. Aggregate Impacts

Earnings levels are reported in Table II-11-CA-10 for the without fish case and in Table II-11-CA-11 for the with fish case. The changes are reported in Table II-11-CA-12. From this latter table, it is clear that the total earnings are higher in the with fish scenario. In 1995 the impact is $1.9 million. By 2020 the impact is a positive $62.3 million. Over the study period, the cumulative increase is $641 million (Table II-11-CA-13). At the 3 percent discount rate the cumulative impact is $312 million.

b. Sectoral Impacts

(1) Other Crops

This sector has the largest absolute increase in earnings. The cumulative increase in earnings is $333 million (present value at 3 percent is $162 million).

(2) Purely Indirect Effects

The miscellaneous agriculture sector earnings increase by $65.4 million through the study period (Table II-11-CA-13).

5. Fiscal Effects

Total tax collections increase as a result of the listing and proposed critical habitat designation. In Table II-12-CA-16 the increase in the total indirect business taxes is reported as $0.3 million in 1995, $2.4 million in 2005, and $10.1 million in 2020. Personal income taxes exhibit a similar pattern as is shown in Table II-11-CA-20. In 1995 the increase in this source of government revenue is $0.5 million. By 2020 the increase is $15.6 million.

6. Summary

The impacts from the actions taken to preserve and recover the endangered fishes provide a benefit to California as aggregate output is above the baseline projections. Certain sectors also benefit from the expansion that is projected for the agriculture sectors. The cumulative impact over the study period is 0.0089 percent of total output (see Table II-11-CA-22).

The total effect on the treasury revenues is positive. In 1995 the increase in personal income taxes plus indirect business taxes is $0.8 million. The total cumulative effect over the study period is $260 million (summing the total in Tables II-11-CA-17 and II-11-CA-21).

Table II-11-CA-2. California: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	6053.0	5968.6	5848.4	5630.2	5442.7	5195.1	4867.8
Other Crops	10652.9	10576.1	10352.8	10015.8	9710.7	9259.9	8676.5
Livestock Feed	2036.9	2028.1	1975.7	1918.8	1854.9	1768.8	1657.4
Misc. Agriculture	6708.8	7252.7	7832.9	8443.1	8867.4	9160.0	9378.0
Non-petroleum Mines	1591.2	1573.5	1574.1	1555.6	1529.3	1491.1	1432.9
Petroleum & Gas Production	12028.2	11761.4	11567.3	11308.9	11055.1	10801.9	10490.8
New Construction	60949.3	65325.4	69754.5	72705.1	74457.3	75626.3	76261.5
Combined Manufacturing	184926.9	194709.5	200920.8	204316.3	205807.8	203255.8	197219.1
Food Products	39039.7	39828.3	40262.4	39960.5	39409.0	37690.8	35527.3
Wood Products	25641.4	28041.5	29550.1	30519.3	31032.1	31013.4	30473.8
Petroleum & Coal Products	37834.6	37479.0	37598.9	37121.4	36527.5	34850.9	32693.6
Transp, Comm, & Utilities	42705.0	46074.4	49041.6	50606.0	51845.9	52753.2	53122.5
Recreation Services	67983.1	75257.3	82105.7	88280.1	92464.5	95404.9	97484.7
Electric Power Production	8682.5	9495.2	10143.7	10514.0	10726.3	10821.8	10699.5
Wholesale/Retail Trade	44926.4	49288.7	53453.6	56292.0	57975.1	59128.8	59720.1
Finance, Insurance, Real Estate	142032.4	155099.4	166421.7	174343.3	179643.4	182338.0	182392.7
Household and Business Services	84724.8	92494.0	100217.3	105659.1	109135.3	112507.5	115927.8
Local Amusements	18275.4	19975.0	21453.2	22504.4	23134.5	23574.0	23625.9
Health, Education, Social Services	60825.2	67333.5	73595.5	78084.8	80661.6	81871.5	82117.1
Government Industries	57403.4	61019.8	63460.6	64920.2	65569.4	65897.2	67281.1
TOTAL	915021.0	980581.4	1037130.9	1074698.9	1096849.8	1104411.1	1101050.3

Table II-11-CA-3. California: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	6053.0	5968.7	5848.6	5630.8	5443.8	5196.8	4870.3
Other Crops	10652.9	10582.7	10373.2	10065.0	9797.7	9399.5	8881.2
Livestock Feed	2036.9	2029.4	1979.6	1928.2	1871.6	1795.5	1696.5
Misc. Agriculture	6708.8	7253.3	7834.7	8447.4	8875.1	9172.7	9397.1
Non-petroleum Mines	1591.2	1573.5	1574.2	1555.6	1529.5	1491.3	1433.3
Petroleum & Gas Production	12028.2	11761.6	11567.9	11310.2	11057.3	10805.5	10496.2
New Construction	60949.3	65325.6	69755.0	72706.3	74459.5	75629.9	76267.0
Combined Manufacturing	184926.9	194709.9	200921.8	204318.9	205812.5	203263.3	197230.2
Food Products	39039.7	39828.3	40262.5	39960.7	39409.4	37691.4	35528.2
Wood Products	25641.4	28041.6	29550.5	30520.3	31033.8	31016.3	30478.0
Petroleum & Coal Products	37834.6	37479.6	37600.8	37125.9	36535.4	34863.4	32712.0
Transp, Comm, & Utilities	42705.0	46074.7	49042.4	50608.1	51849.5	52759.1	53131.4
Recreation Services	67983.1	75257.4	82106.1	88281.1	92466.4	95408.0	97489.3
Electric Power Production	8682.5	9495.3	10144.0	10514.6	10727.5	10823.7	10702.4
Wholesale/Retail Trade	44926.4	49288.8	53453.8	56292.5	57975.9	59130.2	59722.1
Finance, Insurance, Real Estate	142032.4	155100.2	166424.3	174349.8	179655.0	182357.0	182421.0
Household and Business Services	84724.8	92494.3	100218.1	105661.1	109139.0	112513.6	115937.0
Local Amusements	18275.4	19975.0	21453.2	22504.6	23134.8	23574.6	23626.7
Health, Education, Social Services	60825.2	67333.5	73595.5	78084.9	80661.7	81871.7	82117.4
Government Industries	57403.4	61019.8	63460.7	64920.4	65569.8	65897.9	67282.0
TOTAL	915021.0	980593.1	1037166.8	1074786.4	1097005.2	1104661.4	1101419.3

Table II-11-CA-4. California: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.1	0.2	0.6	1.0	1.7	2.5
Other Crops	0.0	6.6	20.3	49.2	87.0	139.6	204.7
Livestock Feed	0.0	1.3	3.9	9.4	16.6	26.7	39.1
Misc. Agriculture	0.0	0.5	1.7	4.3	7.8	12.7	19.1
Non-petroleum Mines	0.0	0.0	0.0	0.1	0.1	0.2	0.4
Petroleum & Gas Production	0.0	0.2	0.5	1.3	2.2	3.6	5.4
New Construction	0.0	0.2	0.5	1.2	2.2	3.6	5.5
Combined Manufacturing	0.0	0.3	1.1	2.6	4.6	7.5	11.0
Food Products	0.0	0.0	0.1	0.2	0.4	0.6	0.8
Wood Products	0.0	0.1	0.4	1.0	1.8	2.8	4.2
Petroleum & Coal Products	0.0	0.6	1.8	4.4	7.9	12.6	18.4
Transp, Comm, & Utilities	0.0	0.3	0.8	2.0	3.6	5.9	8.9
Recreation Services	0.0	0.1	0.4	1.0	1.9	3.1	4.6
Electric Power Production	0.0	0.1	0.3	0.7	1.2	1.9	2.8
Wholesale/Retail Trade	0.0	0.1	0.2	0.5	0.8	1.3	2.0
Finance, Insurance, Real Estate	0.0	0.8	2.6	6.5	11.7	19.0	28.3
Household and Business Services	0.0	0.3	0.8	2.1	3.7	6.1	9.2
Local Amusements	0.0	0.0	0.1	0.2	0.3	0.5	0.8
Health, Education, Social Services	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Government Industries	0.0	0.0	0.1	0.2	0.4	0.6	0.9
TOTAL	0.0	11.7	36.0	87.5	155.3	250.3	369.0

Table II-11-CA-5. California: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		25.6	12.5	8.0	2.9
Other Crops		2131.7	1041.2	666.4	244.3
Livestock Feed		407.3	199.0	127.4	46.7
Misc. Agriculture		192.9	93.7	59.8	21.7
Non-petroleum Mines		3.7	1.8	1.1	0.4
Petroleum & Gas Production		55.1	26.9	17.2	6.3
New Construction		55.3	26.9	17.2	6.2
Combined Manufacturing		113.6	55.4	35.4	12.9
Food Products		8.7	4.3	2.7	1.0
Wood Products		43.3	21.1	13.5	4.9
Petroleum & Coal Products		191.9	93.8	60.0	22.0
Transp, Comm, & Utilities		90.4	44.0	28.1	10.2
Recreation Services		46.6	22.6	14.4	5.2
Electric Power Production		29.1	14.2	9.0	3.3
Wholesale/Retail Trade		20.2	9.8	6.3	2.3
Finance, Insurance, Real Estate		288.4	140.4	89.6	32.6
Household and Business Services		92.6	45.0	28.7	10.4
Local Amusements		8.2	4.0	2.5	0.9
Health, Eeducation, Social Services		3.2	1.6	1.0	0.4
Government Industries		9.4	4.6	2.9	1.1
TOTAL		3817.0	1862.5	1191.2	435.7

Table II-11-CA-6. California: Employment - Without Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	72371.0	69620.9	68019.6	66060.6	63986.3	61074.9	57227.2
Other Crops	327223.2	314788.7	307548.6	298691.2	289312.3	276148.6	258751.2
Livestock Feed	19711.0	18961.9	18525.8	17992.3	17427.3	16634.4	15586.4
Misc. Agriculture	297684.9	321499.7	347219.7	374268.1	392682.1	405640.6	415294.8
Non-petroleum Mines	18707.5	18335.3	18324.3	18108.0	17820.1	17374.6	16697.0
Petroleum & Gas Production	22199.1	21513.2	21158.2	20726.6	20301.7	19836.8	19265.5
New Construction	620156.8	664684.1	709749.7	739772.1	757600.6	769494.9	775958.7
Combined Manufacturing	2097203.4	2208145.5	2278585.3	2317093.4	2334008.2	2305066.5	2236606.0
Food Products	204651.4	208785.4	211061.2	209478.2	206587.4	197580.2	186239.1
Wood Products	331515.9	362545.8	382050.7	394582.0	401211.0	400970.2	393993.4
Petroleum & Coal Products	25035.6	24800.3	24879.6	24563.7	24170.6	23061.2	21633.7
Transp, Comm, & Utilities	522945.1	564205.5	600540.3	619697.6	634880.2	645990.6	650512.5
Recreation Services	1461226.3	1617577.5	1764777.1	1897488.3	1987429.3	2050629.5	2095333.3
Electric Power Production	44664.4	48845.0	52181.1	54085.7	55178.2	55669.3	55040.3
Wholesale/Retail Trade	2321651.2	2547083.5	2762312.1	2908990.8	2995969.7	3055589.5	3086145.3
Finance, Insurance, Real Est.	958313.5	1046478.3	1122871.2	1176319.9	1212080.0	1230261.2	1230630.3
Household and Business Serv.	1535682.0	1676504.0	1816492.1	1915127.6	1978135.3	2039259.7	2101253.2
Local Amusements	262064.5	286436.4	307632.7	322706.7	331742.5	338045.6	338789.3
Health, Education, Soc. Serv.	1410414.8	1561329.2	1706532.9	1810631.4	1870382.2	1898437.9	1904133.2
Government Industries	2510621.7	2668790.8	2775542.5	2839379.9	2867773.7	2882112.6	2942637.0
TOTAL	15064043.2	16250930.8	17296004.6	18025763.9	18458678.6	18688878.8	18801727.3

Table II-11-CA-7. California: Employment - With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	72371.0	69621.8	68022.4	66067.5	63998.6	61094.6	57256.1
Other Crops	327223.2	314986.6	308152.3	300158.8	291904.7	280312.9	264856.3
Livestock Feed	19711.0	18973.8	18562.2	18080.6	17583.5	16885.3	15954.3
Misc. Agriculture	297684.9	321524.0	347296.5	374459.0	393026.0	406203.0	416140.7
Non-petroleum Mines	18707.5	18335.4	18324.7	18109.0	17821.8	17377.4	16701.1
Petroleum & Gas Production	22199.1	21513.5	21159.1	20728.9	20305.7	19843.4	19275.3
New Construction	620156.8	664685.7	709754.8	739784.7	757623.2	769531.9	776014.2
Combined Manufacturing	2097203.4	2208149.4	2278597.3	2317122.8	2334060.6	2305151.1	2236731.0
Food Products	204651.4	208785.5	211061.6	209479.3	206589.3	197583.2	186243.5
Wood Products	331515.9	362547.4	382055.9	394594.7	401233.7	401007.1	394047.9
Petroleum & Coal Products	25035.6	24800.7	24880.8	24566.6	24175.8	23069.5	21645.9
Transp, Comm, & Utilities	522945.1	564208.7	600550.5	619722.4	634924.7	646063.4	650621.7
Recreation Services	1461226.3	1617580.4	1764786.1	1897510.7	1987469.6	2050695.4	2095432.3
Electric Power Production	44664.4	48845.4	52182.5	54089.1	55184.3	55679.2	55054.9
Wholesale/Retail Trade	2321651.2	2547086.5	2762321.6	2909014.4	2996011.8	3055658.2	3086248.4
Finance, Insurance, Real Est.	958313.5	1046484.0	1122889.0	1176363.7	1212158.6	1230389.3	1230821.3
Household and Business Serv.	1535682.0	1676508.8	1816507.3	1915165.1	1978202.5	2039370.0	2101420.3
Local Amusements	262064.5	286436.8	307633.8	322709.4	331747.3	338053.3	338800.8
Health, Education, Soc. Serv.	1410414.8	1561329.4	1706533.5	1810633.0	1870385.2	1898442.8	1904140.6
Government Industries	2510621.7	2668792.0	2775546.2	2839389.2	2867790.2	2882139.4	2942677.8
TOTAL	15064043.2	16251195.8	17296818.1	18027748.8	18462197.1	18694550.3	18810084.4

Table II-11-CA-8. California: Employment - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.9	2.8	6.9	12.3	19.7	28.9
Other Crops	0.0	197.9	603.7	1467.6	2592.4	4164.3	6105.1
Livestock Feed	0.0	11.9	36.4	88.3	156.1	250.9	367.9
Misc. Agriculture	0.0	24.3	76.8	190.9	344.0	562.5	845.9
Non-petroleum Mines	0.0	0.1	0.4	1.0	1.7	2.8	4.1
Petroleum & Gas Production	0.0	0.3	0.9	2.3	4.1	6.6	9.9
New Construction	0.0	1.6	5.2	12.7	22.6	37.0	55.5
Combined Manufacturing	0.0	3.9	12.0	29.4	52.4	84.6	125.0
Food Products	0.0	0.1	0.4	1.1	1.9	3.0	4.4
Wood Products	0.0	1.7	5.2	12.7	22.7	36.8	54.6
Petroleum & Coal Products	0.0	0.4	1.2	2.9	5.2	8.3	12.2
Transp, Comm, & Utilities	0.0	3.2	10.1	24.8	44.5	72.8	109.2
Recreation Services	0.0	2.9	9.0	22.4	40.3	65.9	99.0
Electric Power Production	0.0	0.4	1.4	3.4	6.1	9.9	14.6
Wholesale/Retail Trade	0.0	3.0	9.6	23.5	42.1	68.8	103.1
Finance, Insurance, Real Estate	0.0	5.7	17.8	43.8	78.6	128.0	191.0
Household and Business Services	0.0	4.8	15.2	37.5	67.2	110.3	167.1
Local Amusements	0.0	0.3	1.1	2.6	4.7	7.7	11.5
Health, Education, Social Services	0.0	0.2	0.7	1.7	3.0	4.9	7.3
Government Industries	0.0	1.2	3.8	9.2	16.5	26.8	40.8
TOTAL	0.0	265.0	813.8	1984.7	3518.4	5671.6	8357.1

Table II-11-CA-9. California: Jobs Available (Listing and Critical Habitat)
(Number of Jobs)

	Change of Number of Jobs Available for Five Incremental Years						
INDUSTRIAL SECTORS	1989-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	TOTAL
Livestock	0.9	1.9	4.1	5.3	7.4	9.2	28.9
Other Crops	197.9	405.8	863.8	1124.8	1571.9	1940.8	6105.1
Livestock Feed	11.9	24.5	51.9	67.8	94.8	117.0	367.9
Misc. Agriculture	24.3	52.5	114.1	153.1	218.5	283.4	845.9
Non-petroleum Mines	0.1	0.3	0.6	0.8	1.1	1.3	4.1
Petroleum & Gas Production	0.3	0.6	1.4	1.8	2.5	3.3	9.9
New Construction	1.6	3.5	7.5	10.0	14.3	18.5	55.5
Combined Manufacturing	3.9	8.1	17.4	23.0	32.2	40.4	125.0
Food Products	0.1	0.3	0.6	0.8	1.1	1.4	4.4
Wood Products	1.7	3.5	7.5	10.0	14.1	17.8	54.6
Petroleum & Coal Products	0.4	0.8	1.7	2.3	3.1	3.8	12.2
Transp, Comm, & Utilities	3.2	6.9	14.7	19.7	28.3	36.4	109.2
Recreation Services	2.9	6.2	13.4	17.9	25.6	33.1	99.0
Electric Power Production	0.4	0.9	2.0	2.7	3.8	4.8	14.6
Wholesale/Retail Trade	3.0	6.5	14.0	18.6	26.6	34.3	103.1
Finance, Insurance, Real Estate	5.7	12.2	26.0	34.8	49.4	62.9	191.0
Household and Business Services	4.8	10.4	22.2	29.7	43.1	56.9	167.1
Local Amusements	0.3	0.7	1.6	2.1	3.0	3.8	11.5
Health, Education, Social Services	0.2	0.5	1.0	1.3	1.9	2.4	7.3
Government Industries	1.2	2.6	5.5	7.2	10.4	14.0	40.8
TOTAL	265.0	548.9	1170.9	1533.7	2153.1	2685.5	8357.1

Table II-11-CA-10. California: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	364.8	359.7	352.5	339.4	328.1	313.1	293.4
Other Crops	1664.4	1652.4	1617.5	1564.9	1517.2	1446.8	1355.6
Livestock Feed	68.6	68.3	66.6	64.6	62.5	59.6	55.8
Misc. Agriculture	2276.2	2460.7	2657.6	2864.6	3008.5	3107.8	3181.8
Non-petroleum Mines	455.8	450.8	451.0	445.6	438.1	427.2	410.5
Petroleum & Gas Production	848.0	829.2	815.5	797.3	779.4	761.6	739.6
New Construction	20767.7	22258.8	23768.0	24773.3	25370.4	25768.7	25985.2
Combined Manufacturing	60578.3	63782.9	65817.5	66929.9	67418.5	66582.5	64605.0
Food Products	5504.3	5615.5	5676.7	5634.2	5556.4	5314.2	5009.1
Wood Products	7139.6	7807.9	8227.9	8497.8	8640.6	8635.4	8485.1
Petroleum & Coal Products	1540.3	1525.8	1530.7	1511.2	1487.1	1418.8	1331.0
Transp, Comm, & Utilities	14174.1	15292.4	16277.2	16796.5	17208.0	17509.1	17631.7
Recreation Services	19371.1	21443.8	23395.2	25154.5	26346.8	27184.6	27777.3
Electric Power Production	1122.9	1228.0	1311.9	1359.8	1387.3	1399.6	1383.8
Wholesale/Retail Trade	20714.5	22725.9	24646.2	25954.9	26731.0	27262.9	27535.6
Finance, Insurance, Real Estate	19952.3	21787.9	23378.5	24491.3	25235.8	25614.4	25622.0
Household and Business Services	33382.5	36443.7	39486.7	41630.8	43000.5	44329.2	45676.8
Local Amusements	5168.3	5648.9	6067.0	6364.2	6542.4	6666.7	6681.4
Health, Education, Social Services	28024.6	31023.3	33908.4	35976.8	37164.1	37721.5	37834.7
Government Industries	53837.6	57229.3	59518.5	60887.4	61496.3	61803.8	63101.7
TOTAL	296956.0	319635.3	338971.1	352039.2	359718.9	363327.5	364697.1

Table II-11-CA-11. California: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	364.8	359.8	352.5	339.4	328.1	313.2	293.5
Other Crops	1664.4	1653.4	1620.7	1572.5	1530.8	1468.6	1387.6
Livestock Feed	68.6	68.4	66.7	65.0	63.1	60.5	57.2
Misc. Agriculture	2276.2	2460.9	2658.2	2866.1	3011.2	3112.1	3188.3
Non-petroleum Mines	455.8	450.8	451.0	445.7	438.2	427.2	410.6
Petroleum & Gas Production	848.0	829.2	815.6	797.4	779.6	761.8	740.0
New Construction	20767.7	22258.9	23768.1	24773.8	25371.1	25769.9	25987.0
Combined Manufacturing	60578.3	63783.0	65817.9	66930.7	67420.0	66584.9	64608.6
Food Products	5504.3	5615.5	5676.8	5634.2	5556.5	5314.2	5009.2
Wood Products	7139.6	7807.9	8228.1	8498.1	8641.1	8636.2	8486.3
Petroleum & Coal Products	1540.3	1525.8	1530.7	1511.4	1487.4	1419.3	1331.7
Transp, Comm, & Utilities	14174.1	15292.5	16277.5	16797.2	17209.2	17511.1	17634.7
Recreation Services	19371.1	21443.8	23395.3	25154.8	26347.3	27185.5	27778.6
Electric Power Production	1122.9	1228.1	1312.0	1359.9	1387.4	1399.9	1384.2
Wholesale/Retail Trade	20714.5	22725.9	24646.3	25955.1	26731.4	27263.5	27536.5
Finance, Insurance, Real Estate	19952.3	21788.1	23378.8	24492.2	25237.5	25617.0	25626.0
Household and Business Services	33382.5	36443.8	39487.0	41631.7	43002.0	44331.6	45680.4
Local Amusements	5168.3	5648.9	6067.0	6364.3	6542.5	6666.9	6681.6
Health, Education, Social Services	28024.6	31023.3	33908.4	35976.9	37164.1	37721.6	37834.9
Government Industries	53837.6	57229.4	59518.6	60887.6	61496.7	61804.4	63102.5
TOTAL	296956.0	319637.3	338977.1	352053.8	359745.0	363369.6	364759.4

Table II-11-CA-12. California: Earnings - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Other Crops	0.0	1.0	3.2	7.7	13.6	21.8	32.0
Livestock Feed	0.0	0.0	0.1	0.3	0.6	0.9	1.3
Misc. Agriculture	0.0	0.2	0.6	1.5	2.6	4.3	6.5
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Petroleum & Gas Production	0.0	0.0	0.0	0.1	0.2	0.3	0.4
New Construction	0.0	0.1	0.2	0.4	0.8	1.2	1.9
Combined Manufacturing	0.0	0.1	0.3	0.8	1.5	2.4	3.6
Food Products	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Wood Products	0.0	0.0	0.1	0.3	0.5	0.8	1.2
Petroleum & Coal Products	0.0	0.0	0.1	0.2	0.3	0.5	0.7
Transp, Comm, & Utilities	0.0	0.1	0.3	0.7	1.2	2.0	3.0
Recreation Services	0.0	0.0	0.1	0.3	0.5	0.9	1.3
Electric Power Production	0.0	0.0	0.0	0.1	0.2	0.2	0.4
Wholesale/Retail Trade	0.0	0.0	0.1	0.2	0.4	0.6	0.9
Finance, Insurance, Real Estate	0.0	0.1	0.4	0.9	1.6	2.7	4.0
Household and Business Services	0.0	0.1	0.3	0.8	1.5	2.4	3.6
Local Amusements	0.0	0.0	0.0	0.1	0.1	0.2	0.2
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Government Industries	0.0	0.0	0.1	0.2	0.4	0.6	0.9
TOTAL	0.0	1.9	6.0	14.6	26.1	42.1	62.3

Table II-11-CA-13. California: Earnings - Present Values of Differences By Sector (Listing and Critical Habitat)
(1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		1.5	0.8	0.5	0.2
Other Crops		333.0	162.7	104.1	38.2
Livestock Feed		13.7	6.7	4.3	1.6
Misc. Agriculture		65.4	31.8	20.3	7.4
Non-petroleum Mines		1.0	0.5	0.3	0.1
Petroleum & Gas Production		3.9	1.9	1.2	0.4
New Construction		18.8	9.2	5.8	2.1
Combined Manufacturing		37.2	18.1	11.6	4.2
Food Products		1.2	0.6	0.4	0.1
Wood Products		12.1	5.9	3.8	1.4
Petroleum & Coal Products		7.8	3.8	2.4	0.9
Transp, Comm, & Utilities		30.0	14.6	9.3	3.4
Recreation Services		13.3	6.5	4.1	1.5
Electric Power Production		3.8	1.8	1.2	0.4
Wholesale/Retail Trade		9.3	4.5	2.9	1.1
Finance, Insurance, Real Estate		40.5	19.7	12.6	4.6
Household and Business Services		36.5	17.7	11.3	4.1
Local Amusements		2.3	1.1	0.7	0.3
Health, Education, Social Services		1.5	0.7	0.5	0.2
Government Industries		8.8	4.3	2.7	1.0
TOTAL		641.8	312.9	200.0	73.1

Table II-11-CA-14. California: Indirect Business Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	99.9	98.5	96.5	92.9	89.8	85.8	80.4
Other Crops	151.8	150.8	147.6	142.8	138.4	132.0	123.7
Livestock Feed	39.3	39.2	38.2	37.1	35.8	34.2	32.0
Misc. Agriculture	142.4	153.9	166.2	179.2	188.2	194.4	199.0
Non-petroleum Mines	77.9	77.0	77.1	76.1	74.9	73.0	70.1
Petroleum & Gas Production	1359.4	1329.3	1307.3	1278.1	1249.4	1220.8	1185.7
New Construction	682.3	731.3	780.9	813.9	833.6	846.6	853.8
Combined Manufacturing	1884.8	1984.5	2047.8	2082.4	2097.6	2071.6	2010.1
Food Products	1120.2	1142.8	1155.2	1146.6	1130.7	1081.4	1019.4
Wood Products	293.6	321.0	338.3	349.4	355.3	355.1	348.9
Petroleum & Coal Products	975.5	966.4	969.5	957.2	941.8	898.6	843.0
Transp, Comm, & Utilities	2023.8	2183.5	2324.1	2398.2	2457.0	2500.0	2517.5
Recreation Services	3039.0	3364.2	3670.3	3946.4	4133.4	4264.9	4357.8
Electric Power Production	339.2	370.9	396.2	410.7	419.0	422.7	417.9
Wholesale/Retail Trade	6615.4	7257.7	7871.0	8288.9	8536.8	8706.7	8793.7
Finance, Insurance, Real Estate	17493.7	19103.1	20497.7	21473.4	22126.1	22458.0	22464.8
Household and Business Services	978.4	1068.1	1157.3	1220.2	1260.3	1299.3	1338.8
Local Amusements	564.1	616.6	662.2	694.6	714.1	727.6	729.2
Health, Education, Social Services	141.2	156.3	170.9	181.3	187.3	190.1	190.7
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	38022.0	41115.2	43874.4	45769.4	46969.6	47562.8	47576.4

Table II-11-CA-15. California: Indirect Business Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Tax						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	99.9	98.5	96.5	92.9	89.9	85.8	80.4
Other Crops	151.8	150.8	147.9	143.5	139.7	134.0	126.6
Livestock Feed	39.3	39.2	38.2	37.2	36.1	34.7	32.8
Misc. Agriculture	142.4	153.9	166.3	179.3	188.3	194.7	199.4
Non-petroleum Mines	77.9	77.0	77.1	76.1	74.9	73.0	70.2
Petroleum & Gas Production	1359.4	1329.3	1307.4	1278.3	1249.7	1221.2	1186.3
New Construction	682.3	731.3	780.9	814.0	833.6	846.7	853.8
Combined Manufacturing	1884.8	1984.5	2047.8	2082.4	2097.7	2071.7	2010.2
Food Products	1120.2	1142.8	1155.2	1146.6	1130.8	1081.5	1019.4
Wood Products	293.6	321.1	338.3	349.4	355.3	355.1	348.9
Petroleum & Coal Products	975.5	966.4	969.5	957.3	942.0	898.9	843.5
Transp, Comm, & Utilities	2023.8	2183.5	2324.1	2398.3	2457.2	2500.3	2517.9
Recreation Services	3039.0	3364.2	3670.4	3946.4	4133.5	4265.0	4358.0
Electric Power Production	339.2	370.9	396.2	410.7	419.0	422.8	418.1
Wholesale/Retail Trade	6615.4	7257.7	7871.0	8289.0	8536.9	8706.9	8794.0
Finance, Insurance, Real Estate	17493.7	19103.2	20498.0	21474.2	22127.6	22460.4	22468.3
Household and Business Services	978.4	1068.1	1157.3	1220.2	1260.4	1299.3	1338.9
Local Amusements	564.1	616.6	662.2	694.6	714.1	727.7	729.3
Health, Education, Social Services	141.2	156.3	170.9	181.3	187.3	190.1	190.7
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	38022.0	41115.5	43875.3	45771.8	46973.8	47569.6	47586.5

Table II-11-CA-16. California: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.1	0.3	0.7	1.2	2.0	2.9
Livestock Feed	0.0	0.0	0.1	0.2	0.3	0.5	0.8
Misc. Agriculture	0.0	0.0	0.0	0.1	0.2	0.3	0.4
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.1	0.1	0.3	0.4	0.6
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.1	0.2	0.3	0.5
Transp, Comm, & Utilities	0.0	0.0	0.0	0.1	0.2	0.3	0.4
Recreation Services	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Finance, Insurance, Real Estate	0.0	0.1	0.3	0.8	1.4	2.3	3.5
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Serv.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.3	1.0	2.4	4.2	6.8	10.1

Table II-11-CA-17. California: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.4	0.2	0.1	0.0
Other Crops		30.4	14.8	9.5	3.5
Livestock Feed		7.9	3.8	2.5	0.9
Misc. Agriculture		4.1	2.0	1.3	0.5
Non-petroleum Mines		0.2	0.1	0.1	0.0
Petroleum & Gas Production		6.2	3.0	1.9	0.7
New Construction		0.6	0.3	0.2	0.1
Combined Manufacturing		1.2	0.6	0.4	0.1
Food Products		0.3	0.1	0.1	0.0
Wood Products		0.5	0.2	0.2	0.1
Petroleum & Coal Products		4.9	2.4	1.5	0.6
Transp, Comm, & Utilities		4.3	2.1	1.3	0.5
Recreation Services		2.1	1.0	0.6	0.2
Electric Power Production		1.1	0.6	0.4	0.1
Wholesale/Retail Trade		3.0	1.4	0.9	0.3
Finance, Insurance, Real Estate		35.5	17.3	11.0	4.0
Household and Business Services		1.1	0.5	0.3	0.1
Local Amusements		0.3	0.1	0.1	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		104.0	50.7	32.4	11.8

Table II-11-CA-18. California: Personal Income Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	91.2	89.9	88.1	84.8	82.0	78.3	73.4
Other Crops	416.1	413.1	404.4	391.2	379.3	361.7	338.9
Livestock Feed	17.2	17.1	16.6	16.2	15.6	14.9	14.0
Misc. Agriculture	569.0	615.2	664.4	716.2	752.1	777.0	795.4
Non-petroleum Mines	114.0	112.7	112.7	111.4	109.5	106.8	102.6
Petroleum & Gas Production	212.0	207.3	203.9	199.3	194.9	190.4	184.9
New Construction	5191.9	5564.7	5942.0	6193.3	6342.6	6442.2	6496.3
Combined Manufacturing	15144.6	15945.7	16454.4	16732.5	16854.6	16645.6	16151.2
Food Products	1376.1	1403.9	1419.2	1408.5	1389.1	1328.5	1252.3
Wood Products	1784.9	1952.0	2057.0	2124.5	2160.1	2158.8	2121.3
Petroleum & Coal Products	385.1	381.4	382.7	377.8	371.8	354.7	332.7
Transp, Comm, & Utilities	3543.5	3823.1	4069.3	4199.1	4302.0	4377.3	4407.9
Recreation Services	4842.8	5360.9	5848.8	6288.6	6586.7	6796.2	6944.3
Electric Power Production	280.7	307.0	328.0	340.0	346.8	349.9	346.0
Wholesale/Retail Trade	5178.6	5681.5	6161.6	6488.7	6682.7	6815.7	6883.9
Finance, Insurance, Real Estate	4988.1	5447.0	5844.6	6122.8	6309.0	6403.6	6405.5
Household and Business Services	8345.6	9110.9	9871.7	10407.7	10750.1	11082.3	11419.2
Local Amusements	1292.1	1412.2	1516.7	1591.1	1635.6	1666.7	1670.4
Health, Education, Social Services	7006.2	7755.8	8477.1	8994.2	9291.0	9430.4	9458.7
Government Industries	13459.4	14307.3	14879.6	15221.9	15374.1	15450.9	15775.4
TOTAL	74239.0	79908.8	84742.8	88009.8	89929.7	90831.9	91174.3

Table II-11-CA-19. California: Personal Income Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	91.2	89.9	88.1	84.8	82.0	78.3	73.4
Other Crops	416.1	413.4	405.2	393.1	382.7	367.1	346.9
Livestock Feed	17.2	17.1	16.7	16.2	15.8	15.1	14.3
Misc. Agriculture	569.0	615.2	664.5	716.5	752.8	778.0	797.1
Non-petroleum Mines	114.0	112.7	112.7	111.4	109.5	106.8	102.7
Petroleum & Gas Production	212.0	207.3	203.9	199.4	194.9	190.5	185.0
New Construction	5191.9	5564.7	5942.0	6193.4	6342.8	6442.5	6496.8
Combined Manufacturing	15144.6	15945.7	16454.5	16732.7	16855.0	16646.2	16152.1
Food Products	1376.1	1403.9	1419.2	1408.5	1389.1	1328.6	1252.3
Wood Products	1784.9	1952.0	2057.0	2124.5	2160.3	2159.0	2121.6
Petroleum & Coal Products	385.1	381.5	382.7	377.9	371.8	354.8	332.9
Transp, Comm, & Utilities	3543.5	3823.1	4069.4	4199.3	4302.3	4377.8	4408.7
Recreation Services	4842.8	5361.0	5848.8	6288.7	6586.8	6796.4	6944.6
Electric Power Production	280.7	307.0	328.0	340.0	346.9	350.0	346.0
Wholesale/Retail Trade	5178.6	5681.5	6161.6	6488.8	6682.8	6815.9	6884.1
Finance, Insurance, Real Estate	4988.1	5447.0	5844.7	6123.0	6309.4	6404.3	6406.5
Household and Business Services	8345.6	9110.9	9871.8	10407.9	10750.5	11082.9	11420.1
Local Amusements	1292.1	1412.2	1516.7	1591.1	1635.6	1666.7	1670.4
Health, Education, Social Services	7006.2	7755.8	8477.1	8994.2	9291.0	9430.4	9458.7
Government Industries	13459.4	14307.3	14879.6	15221.9	15374.2	15451.1	15775.6
TOTAL	74239.0	79909.3	84744.3	88013.5	89936.2	90842.4	91189.9

Table II-11-CA-20. California: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.3	0.8	1.9	3.4	5.5	8.0
Livestock Feed	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Misc. Agriculture	0.0	0.0	0.1	0.4	0.7	1.1	1.6
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.1	0.1
New Construction	0.0	0.0	0.0	0.1	0.2	0.3	0.5
Combined Manufacturing	0.0	0.0	0.1	0.2	0.4	0.6	0.9
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Transp, Comm, & Utilities	0.0	0.0	0.1	0.2	0.3	0.5	0.7
Recreation Services	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.1	0.1	0.2	0.2
Finance, Insurance, Real Estate	0.0	0.0	0.1	0.2	0.4	0.7	1.0
Household and Business Services	0.0	0.0	0.1	0.2	0.4	0.6	0.9
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.1	0.1	0.2
TOTAL	0.0	0.5	1.5	3.7	6.5	10.5	15.6

Table II-11-CA-21. California: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.4	0.2	0.1	0.0
Other Crops		83.3	40.7	26.0	9.5
Livestock Feed		3.4	1.7	1.1	0.4
Misc. Agriculture		16.4	8.0	5.1	1.8
Non-petroleum Mines		0.3	0.1	0.1	0.0
Petroleum & Gas Production		1.0	0.5	0.3	0.1
New Construction		4.7	2.3	1.5	0.5
Combined Manufacturing		9.3	4.5	2.9	1.1
Food Products		0.3	0.2	0.1	0.0
Wood Products		3.0	1.5	0.9	0.3
Petroleum & Coal Products		2.0	1.0	0.6	0.2
Transp, Comm, & Utilities		7.5	3.6	2.3	0.8
Recreation Services		3.3	1.6	1.0	0.4
Electric Power Production		0.9	0.5	0.3	0.1
Wholesale/Retail Trade		2.3	1.1	0.7	0.3
Finance, Insurance, Real Estate		10.1	4.9	3.1	1.1
Household and Business Services		9.1	4.4	2.8	1.0
Local Amusements		0.6	0.3	0.2	0.1
Health, Education, Social Services		0.4	0.2	0.1	0.0
Government Industries		2.2	1.1	0.7	0.2
TOTAL		160.4	78.2	50.0	18.3

Table II-11-CA-22. California: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	0.0114	0.0089	0.0074	0.0046
Earnings	0.0059	0.0046	0.0038	0.0024
Indirect Business Taxes	0.0073	0.0057	0.0048	0.0030
Personal Income Taxes	0.0059	0.0046	0.0038	0.0024

D. Colorado State Impacts

1. Direct Impacts

The direct impacts for Colorado associated with implementing the requirements of the endangered fishes were described in detail by river basin in Chapter II-9. Table II-11-CO-1 reports the State-level direct impacts. Negative direct impacts on the Colorado economy are projected to occur in the agriculture sectors, the recreation sector, and the electric power sector. A positive direct effect occurs in coal (non-petroleum mining sector) and gas (oil and gas mining sector) which would be used to generate electric power in place of hydroelectric generation. There are also positive impacts associated with capital expansions planned in the electric power sector in response to the reduction in the outputs of hydroelectric generated power due to endangered species adjustments.

Table II-11-CO-1. Direct Impacts for Colorado (Listing and Critical Habitat) (1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Livestock Feed	-2.297	-4.595	-8.116	-8.570	-10.337	-13.207
Other Crops	-0.630	-1.261	-1.735	-2.231	-2.716	-3.200
Recreation	-1.535	-3.070	-3.070	-3.070	-3.070	-3.070
Electric Power	-1.981	-3.588	-8.192	-4.179	-7.577	0.663
Non-petroleum Mining	1.309	1.979	3.105	1.378	1.607	1.413
Oil and Gas Mining	2.497	0.252	0.691	1.493	7.543	0.944
Construction	6.35	6.35	6.35	6.35	6.35	6.35
Combined Manufacturing	6.35	6.35	6.35	6.35	6.35	6.35
TOTAL	10.06	2.42	-4.62	-2.461	-1.85	-3.76

Several points may be noted concerning the direct impacts. First, as noted in Chapter II-9, some agriculture sectors experience a negative direct impact due to shifts of water to municipal and industrial (M&I) uses. The growth in the M&I sector is presumed to have been captured in the regional projections of the without fish scenario. The agriculture sectors that are most affected by the shift of water rights are the livestock feed and the other crops sectors.

Second, electric power output is projected to fall and the cost is projected to increase. The cost increase is due to the substitution of thermal power (generated by burning coal and gas) for the hydroelectricity. Thermal generation is a more costly means of meeting the peak load requirements than hydroelectric generation. The resulting increase in the demand for coal and gas is shown in the table of direct impacts.

Thirdly the replacement of hydroelectric generation with thermal generation requires some additional capital investments in the electric power sector. For the purposes of this analysis, the total dollar values of these are split equally between construction and the heavy manufacturing sectors.

Fourth, for Colorado there are both negative direct impacts and positive direct impacts. The positive impacts occur largely as a result of capacity expansion in the electric power production sector. These latter impacts are allocated equally to the construction sector and the combined manufacturing sector (which includes capital equipment manufacture). Other sectors with positive impacts are the coal (non-petroleum mining) and the gas (petroleum and gas mining) sectors. The net effects of these offsetting direct impacts is that the total direct impacts for Colorado are positive in some periods and negative in others.

Finally, the arithmetic sum of the direct impacts over the study period is slightly negative. It is important to note that the positive impacts occur earlier in the study period. The total direct impacts amount to 0.0033 percent of the aggregate State output by the year 2020.

2. Output (Direct and Indirect) Impacts

a. Aggregate Output Impacts

The levels of output are reported in Tables II-11-CO-2 and II-11-CO-3 for the without fish and the with fish scenarios, respectively. The tables and figures reporting the changes from the baseline provide the most immediate picture of the overall impacts on output. Total output is projected to increase in 1995, 2000, 2005 and 2010 due to the effects of actions taken for endangered species. Total output is projected to decline in 2015 and 2020 (Table II-11-CO-4).

Over the study period the positive total impacts exceed the negative. The arithmetic sum of the changes over the study period is $121 million (1982$). As previously noted, it is necessary to discount the stream of future impacts to properly evaluate the overall effects of endangered species actions. At a 3 percent discount rate, the present value of the stream of output changes is $104.5 million and at 5 percent this value is $91.4 million. To place these numbers in perspective it is necessary to relate them to the size of the Colorado economy. The increase ranges from 0.0035 percent of the entire industrial output at 0 percent discount rate to 0.0665 percent at 10 percent.

The total (direct plus indirect) impacts are positive due to the fact that the positive direct impacts occur in sectors with larger multipliers (combined manufacturing and construction) than do the negative direct impacts (livestock feed and other crops).

b. Sectoral Output Impacts

(1) Agriculture Sectors: Livestock Feed and Other Crops

The livestock feed sector is projected to have negative impacts in output throughout the study period. The impacts are projected to be -$2.4 million is 1995, -$7.0 million in 2000, and -$45 million by 2020. The cumulative negative impacts are -$542.9 million over the study period. The present value of this impact is -$272 million at a 3 percent discount rate. The other crops sector is projected to have output impacts of -$137.4 million (present values of

-$69.1 million at 3 percent or -$45.2 million at 5 percent). The output impacts for the combined agriculture sectors amount to -$717.7 million.

(2) New Construction

Total impacts in this sector are projected to be positive. Table II-11-CO-4 reports the output differences between the without fish and the with fish projections. In 1995 the impact due to listing and critical habitat is $6.5 million. Over the whole study period, this sector has a cumulative impact of $612 million (Table II-11-CO-5).

(3) Recreation

There is a negative direct impact in the recreation services sector. The arithmetic sum of the total (direct and indirect) impacts in this sector are -$253 million over the study period (Table II-11-CO-5).

(4) Electric Power Sector

There are negative direct electric power impacts through changes in the availability of hydroelectric generation within Colorado. However, there are some offsetting effects in other sectors that are a direct result of the hydro impacts. The demand increases for coal for thermal electric replacement of hydroelectric generation and an increase in construction activity as noted above. These secondary effects will be addressed below. Electric power output declines -$410 million over the study period (see Table II-11-CO-5).

(5) Coal and Gas Impacts

These sectors are not directly affected by the endangered fishes considerations. However, there is an increase in the gas sector because gas will be used to generate power in place of hydro. The overall effect is that output in the petroleum and gas mining sector will increase $9.6 million by 2020. Coal is the other primary source of energy for thermal electric power. This is included in the non-petroleum mining sector in the I-O models. Output in this sector is projected to rise by $10.1 million in 2020.

(6) Purely Indirect Impacts

As the data reported in Table II-11-CO-4 indicates, all sectors of the Colorado economy experience output changes from the without fish projections. Some of these changes are notable and follow directly from the direct impacts. Livestock production is $2.3 million below the without fish projection by the year 2020. This is largely due to the reductions in the production of livestock feed. The transportation, communications, and utilities sector output is $2.2 million below the without fish by the year 2020. The reduction in the output of electricity is likely the primary cause of this negative indirect impact.

3. Employment Impacts

a. Aggregate Impacts

Employment effects are reported in Tables II-11-CO-6 through II-11-CO-9. As suggested by the output effects, the overall effect on employment is positive in the early part of the study period and negative in the latter part. Table II-11-CO-9 reports the changes in employment during each of the five-year intervals during the study period.

Initially the combination of the direct impacts and the resulting indirect effects leads to an employment increase (136.7 more jobs in 1995). Later in the study period this effect is reversed as employment in Colorado is projected to decline (198.5 foregone jobs in 2020).

b. Sectoral Impacts

(1) Agriculture Sectors: Livestock Feed and Other Crops

The projected output impacts translate into fewer jobs in the agricultural sectors as compared to the without fish projections. Over time these losses increase[67] until annual employment levels in the livestock feed sector are projected to be some 425 jobs lower by the year 2020

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[67] It must be emphasized that the employment results truly are "worst case" numbers. As a result of actions taken for endangered species, certain sectors are projected to decline throughout the study period. Such a secular decline would lead individuals to alter labor force decisions. Fewer persons would enter the sectors that are in decline. Thus the without fish projection probably overstates the employment levels that would exist absent the actions taken to preserve the endangered fishes.

(see Table II-11-CO-8). This is 5.6 percent of the without fish employment level. Similar reductions are projected for the other crops sector.

(2) Recreation Sector

By the year 2020 annual employment has fallen by 462 jobs relative to the without fish projections for this sector (Table II-11-CO-8). This represents 0.2 percent of the without fish scenario employment in this sector.

(3) Electric Power Sector

The employment impacts in this sector are negative throughout the study period. In Table II-11-CO-8, the employment impacts are reported as 9 jobs lost in 1995, 71 lost in 2005, and 129 lost in 2020.

4. Earnings

a. Aggregate Impacts

Total earnings impacts are positive throughout the study period despite the employment decline in the latter part of the period (see Tables II-11-CO-10 to II-11-CO-13). This arises because the sectors that experience a negative direct impact are generally the lower earning sectors (livestock feed and other crops) while the sectors with positive direct impacts are generally the higher earning sectors (construction and combined manufacturing). The net effect is an increase in total earnings.

b. Sectoral Impacts

(1) Agriculture Sectors

Coincident with the negative employment effects are earnings reductions in the livestock feed sector and the other crops sector. From Table II-11-CO-12 shows that annual earnings in the livestock feed sector are projected to be $1.5 million below the without fish earnings. These figures understate household income effects since they omit the changes in proprietary incomes that accrue to the owner-operator of family farms (as stated earlier).

(2) Electric Power

Annual earnings in 2020 decrease by $3.4 million as a result of the decline in employment in this sector.

5. Fiscal Impacts

Personal taxes are projected to increase as a result of the impacts due to endangered species (Table II-11-CO-21). This corresponds to the earnings changes described earlier. The arithmetic sum of the changes over the study period is $7.1 million. At a 3 percent discount rate, the present value of this change is $43.2 million, and at 5 percent it is $30.1 million.

Indirect business taxes are projected to be lower in the with fish scenario by the end of the study period. The arithmetic sum of the difference between the without fish projections and the projections in the with fish case is a -$12.8 million. At a 3 percent discount rate, the present value is -$5.4 million, and at 5 percent it is -$3.0 million.

The arithmetic sum of the total fiscal impact for Colorado is -$65.9 million. The present values are -$37.8 million (at 3 percent) and -$27.1 million (5 percent).

6. Summary

The largest total negative impacts to output occur in the agricultural sectors, the electric power sector, and the recreation sector. These are the sectors experiencing negative direct impacts. There are positive impacts in the construction, combined manufacturing, non-petroleum mining, and the oil and gas mining sectors. Some sectors experiences losses in output, earnings, and employment while others experience gains. Overall, the impact of the actions taken for endangered species on the Colorado economy is positive.

Table II-11-CO-22 reports the present value oif the deviations from the without fish scenario for each of the macroeconomic aggregates. For example, for total output this is 0.0049 percent of the without fish level.

Table II-11-CO-2. Colorado: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	2662.3	2625.1	2572.3	2481.4	2401.3	2301.6	2156.6
Other Crops	636.3	631.7	618.4	599.5	581.8	557.1	527.6
Livestock Feed	966.3	962.1	937.3	912.2	882.7	845.3	800.5
Misc. Agriculture	347.2	375.3	405.4	436.9	458.9	474.0	485.3
Non-petroleum Mines	852.8	843.3	843.7	833.7	821.3	803.2	771.9
Petroleum & Gas Production	2506.8	2405.4	2365.7	2298.7	2234.7	2161.2	2077.3
New Construction	6786.3	7273.5	7766.7	8095.2	8290.3	8420.5	8491.2
Combined Manufacturing	16885.8	17779.0	18346.2	18656.3	18792.4	18371.5	17825.9
Food Products	5920.1	6039.7	6105.5	6059.7	5976.1	5715.5	5387.5
Wood Products	1607.3	1757.7	1852.3	1913.0	1945.2	1946.3	1912.5
Petroleum & Coal Products	1670.6	1654.9	1660.2	1639.1	1612.9	1538.8	1443.6
Transp, Comm, & Utilities	6466.8	6977.0	7426.3	7663.2	7851.0	7988.4	8044.3
Recreation Services	7823.2	8660.3	9448.4	10158.9	10640.4	10978.8	11218.1
Electric Power Production	1677.9	1835.0	1960.3	2031.8	2072.9	2091.3	2067.7
Wholesale/Retail Trade	4648.4	5099.8	5530.7	5824.4	5998.5	6117.9	6179.1
Finance, Insurance, Real Estate	13236.9	14454.7	15509.9	16248.2	16742.1	16993.2	16998.3
Household and Business Services	8382.8	9151.6	9915.7	10454.1	10798.1	11131.7	11470.1
Local Amusements	726.0	793.6	852.3	894.0	919.1	936.5	934.5
Health, Education, Social Services	4920.9	5447.4	5954.0	6317.2	6525.7	6623.6	6643.5
Government Industries	5667.4	6024.5	6265.5	6409.6	6666.0	6699.3	6840.0
TOTAL	94392.1	100791.7	106336.7	109927.3	112211.4	112696.0	112275.5

Table II-11-CO-3. Colorado: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	2662.3	2625.0	2571.9	2480.6	2400.0	2299.9	2154.4
Other Crops	636.3	631.1	616.4	595.8	576.0	548.7	516.3
Livestock Feed	966.3	959.8	930.2	896.9	859.2	812.1	755.4
Misc. Agriculture	347.2	375.3	405.3	436.7	458.5	473.5	484.5
Non-petroleum Mines	852.8	844.7	847.0	840.1	828.9	812.1	782.0
Petroleum & Gas Production	2506.8	2407.9	2368.1	2301.1	2238.1	2170.5	2087.0
New Construction	6786.3	7280.0	7779.7	8114.8	8316.5	8453.3	8530.6
Combined Manufacturing	16885.8	17786.3	18360.7	18677.9	18821.0	18406.2	17866.2
Food Products	5920.1	6039.6	6105.2	6059.2	5975.3	5714.6	5386.3
Wood Products	1607.3	1757.9	1852.5	1913.4	1945.6	1946.8	1913.1
Petroleum & Coal Products	1670.6	1654.8	1659.7	1637.8	1611.1	1536.3	1440.7
Transp, Comm, & Utilities	6466.8	6977.1	7426.2	7662.4	7849.7	7986.4	8042.2
Recreation Services	7823.2	8659.0	9443.9	10151.0	10629.1	10964.1	11200.1
Electric Power Production	1677.9	1833.0	1954.7	2017.8	2054.3	2065.0	2042.2
Wholesale/Retail Trade	4648.4	5100.0	5531.0	5824.9	5999.1	6118.6	6179.9
Finance, Insurance, Real Estate	13236.9	14454.8	15509.5	16246.7	16739.6	16989.8	16993.2
Household and Business Services	8382.8	9152.3	9917.0	10455.7	10800.1	11134.1	11472.8
Local Amusements	726.0	793.6	852.3	894.0	919.0	936.5	934.4
Health, Education, Social Services	4920.9	5447.4	5954.0	6317.2	6525.7	6623.6	6643.4
Government Industries	5667.4	6024.5	6265.5	6409.6	6665.9	6699.2	6839.9
TOTAL	94392.1	100803.9	106351.0	109933.6	112212.7	112691.3	112264.5

Table II-11-CO-4. Colorado: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	-0.1	-0.4	-0.8	-1.2	-1.7	-2.3
Other Crops	0.0	-0.7	-2.0	-3.7	-5.9	-8.4	-11.3
Livestock Feed	0.0	-2.4	-7.0	-15.2	-23.5	-33.2	-45.0
Misc. Agriculture	0.0	0.0	-0.1	-0.2	-0.4	-0.6	-0.8
Non-petroleum Mines	0.0	1.4	3.4	6.3	7.6	8.9	10.1
Petroleum & Gas Production	0.0	2.5	2.4	2.4	3.4	9.4	9.6
New Construction	0.0	6.5	13.1	19.6	26.2	32.9	39.4
Combined Manufacturing	0.0	7.2	14.5	21.6	28.6	34.7	40.4
Food Products	0.0	-0.1	-0.3	-0.5	-0.8	-1.0	-1.2
Wood Products	0.0	0.1	0.2	0.3	0.4	0.5	0.6
Petroleum & Coal Products	0.0	-0.1	-0.5	-1.2	-1.8	-2.6	-2.9
Transp, Comm, & Utilities	0.0	0.1	-0.1	-0.8	-1.3	-2.0	-2.2
Recreation Services	0.0	-1.3	-4.5	-7.9	-11.3	-14.7	-18.1
Electric Power Production	0.0	-1.9	-5.6	-14.1	-18.6	-26.4	-25.5
Wholesale/Retail Trade	0.0	0.2	0.3	0.5	0.6	0.7	0.8
Finance, Insurance, Real Estate	0.0	0.1	-0.4	-1.4	-2.5	-3.4	-5.1
Household and Business Services	0.0	0.7	1.2	1.6	2.0	2.4	2.7
Local Amusements	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
TOTAL	0.0	12.2	14.3	6.3	1.4	-4.6	-10.9

Table II-11-CO-5. Colorado: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	.00	.03	.05	.10
Livestock		-28.2	-14.2	-9.3	-3.6
Other Crops		-137.4	-69.1	-45.2	-17.6
Livestock Feed		-542.9	-272.4	-177.9	-68.7
Misc. Agriculture		-9.2	-4.5	-2.9	-1.1
Non-petroleum Mines		168.7	89.3	60.5	25.7
Petroleum & Gas Production		130.5	68.7	46.9	21.1
New Construction		612.0	324.7	220.9	95.6
Combined Manufacturing		658.2	351.2	239.9	104.8
Food Products		-17.1	-8.9	-5.9	-2.4
Wood Products		9.9	5.4	3.7	1.7
Petroleum & Coal Products		-39.7	-19.9	-13.0	-4.9
Transp, Comm, & Utilities		-26.9	-12.8	-8.0	-2.6
Recreation Services		-253.1	-130.1	-86.3	-34.8
Electric Power Production		-410.3	-210.1	-138.8	-55.1
Wholesale/Retail Trade		13.7	7.4	5.1	2.3
Finance, Insurance, Real Estate		-53.3	-25.5	-16.0	-5.4
Household and Business Services		48.2	26.4	18.3	8.4
Local Amusements		-1.3	-0.7	-0.4	-0.2
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-0.8	-0.3	-0.1	0.0
TOTAL		121.0	104.5	91.4	63.2

Table II-11-CO-6. Colorado: Employment - Without Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	26562.9	25553.5	24965.8	24296.7	23558.1	22580.4	21157.9
Other Crops	15970.0	15363.1	15009.7	14607.5	14163.4	13575.6	12856.1
Livestock Feed	9395.4	9038.4	8830.5	8593.9	8332.6	7986.8	7563.5
Misc. Agriculture	16408.1	17720.8	19138.4	20629.3	21644.3	22358.5	22890.7
Non-petroleum Mines	8991.5	8812.5	8807.3	8703.3	8582.4	8393.5	8066.2
Petroleum & Gas Production	3933.0	3740.3	3678.6	3581.5	3488.7	3373.9	3243.0
New Construction	77529.2	83095.8	88729.7	92483.0	94711.8	96198.8	97006.9
Combined Manufacturing	234406.8	246806.9	254680.0	258984.1	260874.7	255031.1	247456.7
Food Products	34170.4	34860.6	35240.6	34976.3	34493.6	32989.7	31096.1
Wood Products	29082.9	31805.0	33516.1	34615.5	35197.0	35218.1	34605.3
Petroleum & Coal Products	2636.1	2611.3	2619.6	2586.4	2545.0	2428.2	2277.9
Transp, Comm, & Utilities	73459.4	79255.3	84359.4	87050.5	89183.2	90743.9	91379.1
Recreation Services	200175.7	221594.5	241759.6	259939.9	272261.1	280919.0	287043.0
Electric Power Production	8510.6	9307.2	9942.9	10305.8	10514.0	10607.6	10487.7
Wholesale/Retail Trade	245425.5	269256.3	292008.4	307514.1	316708.7	323011.2	326241.4
Finance, Insurance, Real Estate	97508.0	106478.7	114251.7	119690.1	123328.6	125178.6	125216.1
Household and Business Services	167359.9	182706.8	197962.8	208712.2	215578.8	222240.2	228996.3
Local Amusements	25646.7	28031.8	30106.2	31581.4	32465.7	33082.5	33009.7
Health, Education, Social Services	140801.3	155867.1	170362.7	180754.8	186719.7	189520.5	190089.1
Government Industries	267542.4	284397.5	295773.4	302576.2	314679.3	316252.7	322894.0
TOTAL	1685515.7	1816303.6	1931743.6	2012182.4	2069030.7	2091691.0	2103576.5

Table II-11-CO-7. Colorado: Employment - With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	26562.9	25552.3	24962.0	24288.9	23546.1	22563.7	21135.7
Other Crops	15970.0	15347.2	14962.4	14517.5	14020.3	13369.9	12580.5
Livestock Feed	9395.4	9016.2	8764.2	8450.6	8110.4	7673.3	7138.2
Misc. Agriculture	16408.1	17719.4	19133.5	20618.0	21625.7	22331.3	22852.5
Non-petroleum Mines	8991.5	8826.7	8842.3	8769.6	8661.7	8486.5	8171.6
Petroleum & Gas Production	3933.0	3744.2	3682.4	3585.2	3494.0	3388.6	3258.1
New Construction	77529.2	83169.5	88878.9	92706.4	95010.8	96574.5	97456.7
Combined Manufacturing	234406.8	246907.2	254881.4	259284.1	261271.8	255513.5	248017.4
Food Products	34170.4	34860.1	35238.8	34973.1	34489.1	32984.0	31089.3
Wood Products	29082.9	31807.6	33520.6	34621.4	35204.6	35227.2	34615.7
Petroleum & Coal Products	2636.1	2611.1	2618.9	2584.4	2542.1	2424.1	2273.3
Transp, Comm, & Utilities	73459.4	79256.4	84358.2	87041.1	89168.9	90721.3	91354.6
Recreation Services	200175.7	221560.7	241645.6	259738.5	271971.9	280543.0	286580.5
Electric Power Production	8510.6	9297.5	9914.3	10234.5	10419.8	10473.9	10358.4
Wholesale/Retail Trade	245425.5	269265.4	292025.9	307538.4	316739.7	323048.3	326283.1
Finance, Insurance, Real Estate	97508.0	106479.8	114248.9	119679.5	123310.1	125153.3	125178.7
Household and Business Services	167359.9	182721.2	197987.7	208744.4	215618.4	222287.6	229049.9
Local Amusements	25646.7	28031.7	30105.5	31579.9	32463.5	33079.6	33006.2
Health, Education, Social Services	140801.3	155867.4	170363.0	180754.8	186719.5	189520.0	190088.3
Government Industries	267542.4	284398.8	295774.4	302575.2	314677.0	316248.9	322889.3
TOTAL	1685515.7	1816440.3	1931908.6	2012285.5	2069065.4	2091612.4	2103378.1

Table II-11-CO-8. Colorado: Employment - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	-1.3	-3.8	-7.9	-12.0	-16.8	-22.2
Other Crops	0.0	-15.9	-47.3	-90.0	-143.1	-205.7	-275.6
Livestock Feed	0.0	-22.2	-66.3	-143.3	-222.2	-313.5	-425.3
Misc. Agriculture	0.0	-1.4	-5.0	-11.3	-18.5	-27.2	-38.1
Non-petroleum Mines	0.0	14.2	35.1	66.3	79.4	92.9	105.4
Petroleum & Gas Production	0.0	3.9	3.8	3.7	5.3	14.6	15.1
New Construction	0.0	73.7	149.2	223.5	299.0	375.6	449.8
Combined Manufacturing	0.0	100.3	201.3	299.9	397.0	482.4	560.7
Food Products	0.0	-0.5	-1.8	-3.2	-4.5	-5.7	-6.7
Wood Products	0.0	2.5	4.4	5.9	7.5	9.1	10.4
Petroleum & Coal Products	0.0	-0.2	-0.7	-2.0	-2.9	-4.1	-4.6
Transp, Comm, & Utilities	0.0	1.1	-1.2	-9.4	-14.3	-22.6	-24.5
Recreation Services	0.0	-33.8	-114.0	-201.4	-289.2	-376.0	-462.5
Electric Power Production	0.0	-9.8	-28.6	-71.3	-94.2	-133.7	-129.3
Wholesale/Retail Trade	0.0	9.2	17.5	24.3	31.0	37.1	41.7
Finance, Insurance, Real Estate	0.0	1.0	-2.8	-10.6	-18.5	-25.2	-37.4
Household and Business Services	0.0	14.5	24.9	32.3	39.6	47.5	53.6
Local Amusements	0.0	-0.1	-0.7	-1.4	-2.1	-2.9	-3.5
Health, Education, Social Services	0.0	0.3	0.3	0.0	-0.2	-0.5	-0.8
Government Industries	0.0	1.3	1.0	-1.0	-2.2	-3.8	-4.6
TOTAL	0.0	136.7	165.1	103.2	34.7	-78.6	-198.5

Table II-11-CO-9. Colorado: Jobs Available
(Listing and Critical Habitat)
(Number of Jobs)

	CHANGE IN NUMBER OF JOBS AVAILABLE FOR FIVE INCREMENTAL YEARS*						
INDUSTRIAL SECTORS	**1989-1995**	**1995-2000**	**2000-2005**	**2005-2010**	**2010-2015**	**2015-2020**	**TOTAL**
Livestock	-1.3	-2.6	-4.0	-4.2	-4.7	-5.4	-22.2
Other Crops	-15.9	-31.4	-42.7	-53.1	-62.6	-69.9	-275.6
Livestock Feed	-22.2	-44.1	-76.9	-78.9	-91.3	-111.8	-425.3
Misc. Agriculture	-1.4	-3.6	-6.4	-7.2	-8.7	-10.9	-38.1
Non-petroleum Mines	14.2	20.9	31.2	13.1	13.6	12.4	105.4
Petroleum & Gas Production	3.9	-0.1	0.0	1.6	9.3	0.4	15.1
New Construction	73.7	75.5	74.3	75.5	76.6	74.2	449.8
Combined Manufacturing	100.3	101.0	98.6	97.1	85.3	78.3	560.7
Food Products	-0.5	-1.3	-1.3	-1.3	-1.2	-1.1	-6.7
Wood Products	2.5	1.9	1.5	1.6	1.5	1.3	10.4
Petroleum & Coal Products	-0.2	-0.6	-1.2	-0.9	-1.2	-0.5	-4.6
Transp, Comm, & Utilities	1.1	-2.3	-8.2	-4.9	-8.3	-1.9	-24.5
Recreation Services	-33.8	-80.2	-87.4	-87.8	-86.8	-86.5	-462.5
Electric Power Production	-9.8	-18.8	-42.7	-22.9	-39.5	4.4	-129.3
Wholesale/Retail Trade	9.2	8.4	6.8	6.6	6.1	4.7	41.7
Finance, Insurance, Real Estate	1.0	-3.9	-7.7	-8.0	-6.7	-12.2	-37.4
Household and Business Services	14.5	10.5	7.3	7.3	7.9	6.1	53.6
Local Amusements	-0.1	-0.5	-0.8	-0.7	-0.8	-0.6	-3.5
Health, Education, Social Services	0.3	0.0	-0.3	-0.2	-0.3	-0.2	-0.8
Government Industries	1.3	-0.3	-2.0	-1.2	-1.6	-0.8	-4.6
TOTAL	136.7	28.3	-61.9	-68.4	-113.3	-119.9	-198.5

* Change between 1989 and 1995 is six years

Table II-11-CO-10. Colorado: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	159.8	157.6	154.4	148.9	144.1	138.1	129.4
Other Crops	49.3	49.0	47.9	46.5	45.1	43.2	40.9
Livestock Feed	32.6	32.4	31.6	30.7	29.7	28.5	27.0
Misc. Agriculture	139.1	150.3	162.4	175.0	183.8	189.9	194.4
Non-petroleum Mines	287.3	284.1	284.3	280.9	276.7	270.6	260.1
Petroleum & Gas Production	176.7	169.6	166.8	162.1	157.6	152.4	146.5
New Construction	2144.2	2298.2	2454.0	2557.8	2619.5	2660.6	2682.9
Combined Manufacturing	5377.9	5662.4	5843.0	5941.8	5985.2	5851.1	5677.3
Food Products	758.6	773.9	782.3	776.5	765.7	732.4	690.3
Wood Products	500.1	547.0	576.4	595.3	605.3	605.7	595.1
Petroleum & Coal Products	65.3	64.7	64.9	64.1	63.0	60.1	56.4
Transp, Comm, & Utilities	1965.7	2120.8	2257.4	2329.4	2386.5	2428.2	2445.2
Recreation Services	2235.2	2474.3	2699.5	2902.5	3040.1	3136.8	3205.1
Electric Power Production	220.5	241.2	257.6	267.0	272.4	274.9	271.8
Wholesale/Retail Trade	2144.8	2353.0	2551.9	2687.4	2767.7	2822.8	2851.0
Finance, Insurance, Real Estate	1857.0	2027.8	2175.9	2279.4	2348.7	2384.0	2384.7
Household and Business Services	3295.8	3598.0	3898.5	4110.2	4245.4	4376.6	4509.6
Local Amusements	238.4	260.5	279.8	293.5	301.7	307.5	306.8
Health, Education, Social Services	2315.4	2563.2	2801.6	2972.5	3070.6	3116.6	3126.0
Government Industries	5225.1	5554.3	5776.4	5909.3	6145.7	6176.4	6306.1
TOTAL	29188.8	31382.3	33266.5	34530.7	35454.5	35756.2	35906.6

Table II-11-CO-11. Colorado: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	159.8	157.6	154.4	148.9	144.1	138.0	129.3
Other Crops	49.3	48.9	47.8	46.2	44.6	42.5	40.0
Livestock Feed	32.6	32.3	31.3	30.2	28.9	27.4	25.5
Misc. Agriculture	139.1	150.3	162.3	174.9	183.6	189.6	194.1
Non-petroleum Mines	287.3	284.6	285.4	283.0	279.3	273.6	263.5
Petroleum & Gas Production	176.7	169.8	167.0	162.2	157.8	153.0	147.1
New Construction	2144.2	2300.2	2458.1	2564.0	2627.7	2671.0	2695.4
Combined Manufacturing	5377.9	5664.7	5847.7	5948.7	5994.3	5862.2	5690.2
Food Products	758.6	773.9	782.3	776.4	765.6	732.2	690.2
Wood Products	500.1	547.0	576.5	595.4	605.4	605.8	595.3
Petroleum & Coal Products	65.3	64.7	64.9	64.0	63.0	60.0	56.3
Transp, Comm, & Utilities	1965.7	2120.8	2257.4	2329.2	2386.1	2427.6	2444.6
Recreation Services	2235.2	2474.0	2698.2	2900.3	3036.9	3132.6	3200.0
Electric Power Production	220.5	240.9	256.9	265.2	270.0	271.4	268.4
Wholesale/Retail Trade	2144.8	2353.1	2552.0	2687.6	2768.0	2823.1	2851.4
Finance, Insurance, Real Estate	1857.0	2027.9	2175.8	2279.2	2348.4	2383.5	2384.0
Household and Business Services	3295.8	3598.3	3899.0	4110.8	4246.2	4377.5	4510.7
Local Amusements	238.4	260.5	279.8	293.5	301.7	307.4	306.8
Health, Education, Social Services	2315.4	2563.2	2801.6	2972.5	3070.6	3116.6	3126.0
Government Industries	5225.1	5554.3	5776.5	5909.3	6145.6	6176.3	6306.0
TOTAL	29188.8	31387.0	33274.7	34541.4	35467.8	35771.5	35924.5

Table II-11-CO-12. Colorado: Earnings - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Other Crops	0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-0.9
Livestock Feed	0.0	-0.1	-0.2	-0.5	-0.8	-1.1	-1.5
Misc. Agriculture	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.3
Non-petroleum Mines	0.0	0.5	1.1	2.1	2.6	3.0	3.4
Petroleum & Gas Production	0.0	0.2	0.2	0.2	0.2	0.7	0.7
New Construction	0.0	2.0	4.1	6.2	8.3	10.4	12.4
Combined Manufacturing	0.0	2.3	4.6	6.9	9.1	11.1	12.9
Food Products	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Wood Products	0.0	0.0	0.1	0.1	0.1	0.2	0.2
Petroleum & Coal Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Transp, Comm, & Utilities	0.0	0.0	0.0	-0.3	-0.4	-0.6	-0.7
Recreation Services	0.0	-0.4	-1.3	-2.2	-3.2	-4.2	-5.2
Electric Power Production	0.0	-0.3	-0.7	-1.8	-2.4	-3.5	-3.4
Wholesale/Retail Trade	0.0	0.1	0.2	0.2	0.3	0.3	0.4
Finance, Insurance, Real Estate	0.0	0.0	-0.1	-0.2	-0.4	-0.5	-0.7
Household and Business Services	0.0	0.3	0.5	0.6	0.8	0.9	1.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
TOTAL	0.0	4.7	8.2	10.7	13.2	15.3	17.8

Table II-11-CO-13. Colorado: Earnings - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**.00**	**.03**	**.05**	**.10**
Livestock		-1.7	-0.9	-0.6	-0.2
Other Crops		-10.6	-5.4	-3.5	-1.4
Livestock Feed		-18.3	-9.2	-6.0	-2.3
Misc. Agriculture		-3.7	-1.8	-1.2	-0.4
Non-petroleum Mines		56.8	30.1	20.4	8.7
Petroleum & Gas Production		9.2	4.8	3.3	1.5
New Construction		193.4	102.6	69.8	30.2
Combined Manufacturing		209.6	111.9	76.4	33.4
Food Products		-2.2	-1.1	-0.8	-0.3
Wood Products		3.1	1.7	1.2	0.5
Petroleum & Coal Products		-1.6	-0.8	-0.5	-0.2
Transp, Comm, & Utilities		-8.2	-3.9	-2.4	-0.8
Recreation Services		-72.3	-37.2	-24.7	-9.9
Electric Power Production		-53.9	-27.6	-18.2	-7.2
Wholesale/Retail Trade		6.3	3.4	2.4	1.1
Finance, Insurance, Real Estate		-7.5	-3.6	-2.2	-0.8
Household and Business Services		18.9	10.4	7.2	3.3
Local Amusements		-0.4	-0.2	-0.1	-0.1
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-0.7	-0.3	-0.1	0.0
TOTAL		316.3	173.0	120.3	55.0

Table II-11-CO-14. Colorado: Indirect Business Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	52.7	52.0	50.9	49.1	47.5	45.6	42.7
Other Crops	10.8	10.7	10.5	10.2	9.9	9.5	9.0
Livestock Feed	18.7	18.6	18.1	17.6	17.0	16.3	15.5
Misc. Agriculture	7.2	7.8	8.5	9.1	9.6	9.9	10.1
Non-petroleum Mines	53.7	53.1	53.1	52.5	51.7	50.5	48.6
Petroleum & Gas Production	283.3	271.9	267.4	259.8	252.6	244.3	234.8
New Construction	62.7	67.2	71.8	74.8	76.6	77.8	78.5
Combined Manufacturing	184.8	194.5	200.7	204.1	205.6	201.0	195.0
Food Products	360.7	368.0	372.0	369.3	364.2	348.3	328.3
Wood Products	17.7	19.4	20.4	21.1	21.4	21.4	21.1
Petroleum & Coal Products	43.3	42.9	43.1	42.5	41.8	39.9	37.4
Transp, Comm, & Utilities	299.8	323.5	344.3	355.3	364.0	370.3	372.9
Recreation Services	346.4	383.4	418.3	449.8	471.1	486.1	496.7
Electric Power Production	78.3	85.6	91.5	94.8	96.7	97.6	96.5
Wholesale/Retail Trade	685.2	751.7	815.2	858.5	884.2	901.8	910.8
Finance, Insurance, Real Estate	1582.8	1728.4	1854.6	1942.9	2001.9	2032.0	2032.6
Household and Business Services	98.7	107.8	116.8	123.1	127.2	131.1	135.1
Local Amusements	41.4	45.2	48.6	50.9	52.4	53.4	53.2
Health, Education, Social Services	11.5	12.8	14.0	14.8	15.3	15.5	15.6
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4239.7	4544.5	4819.6	5000.2	5110.7	5152.2	5134.3

Table II-11-CO-15. Colorado: Indirect Business Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	52.7	52.0	50.9	49.1	47.5	45.5	42.7
Other Crops	10.8	10.7	10.5	10.1	9.8	9.3	8.8
Livestock Feed	18.7	18.5	18.0	17.3	16.6	15.7	14.6
Misc. Agriculture	7.2	7.8	8.5	9.1	9.6	9.9	10.1
Non-petroleum Mines	53.7	53.1	53.3	52.9	52.2	51.1	49.2
Petroleum & Gas Production	283.3	272.1	267.6	260.1	252.9	245.3	235.9
New Construction	62.7	67.3	71.9	75.0	76.8	78.1	78.8
Combined Manufacturing	184.8	194.6	200.9	204.4	205.9	201.4	195.5
Food Products	360.7	368.0	372.0	369.2	364.1	348.2	328.2
Wood Products	17.7	19.4	20.4	21.1	21.4	21.4	21.1
Petroleum & Coal Products	43.3	42.9	43.1	42.5	41.8	39.9	37.4
Transp, Comm, & Utilities	299.8	323.5	344.3	355.2	363.9	370.2	372.8
Recreation Services	346.4	383.4	418.1	449.4	470.6	485.4	495.9
Electric Power Production	78.3	85.5	91.2	94.1	95.8	96.3	95.3
Wholesale/Retail Trade	685.2	751.8	815.3	858.6	884.3	901.9	910.9
Finance, Insurance, Real Estate	1582.8	1728.4	1854.5	1942.7	2001.6	2031.5	2032.0
Household and Business Services	98.7	107.8	116.8	123.2	127.2	131.2	135.1
Local Amusements	41.4	45.2	48.6	50.9	52.4	53.3	53.2
Health, Education, Social Services	11.5	12.8	14.0	14.8	15.3	15.5	15.6
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4239.7	4544.8	4819.7	4999.7	5109.8	5151.3	5133.0

Table II-11-CO-16. Colorado: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Livestock Feed	0.0	0.0	-0.1	-0.3	-0.5	-0.6	-0.9
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.1	0.2	0.4	0.5	0.6	0.6
Petroleum & Gas Production	0.0	0.3	0.3	0.3	0.4	1.1	1.1
New Construction	0.0	0.1	0.1	0.2	0.2	0.3	0.4
Combined Manufacturing	0.0	0.1	0.2	0.2	0.3	0.4	0.4
Food Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Recreation Services	0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-0.8
Electric Power Production	0.0	-0.1	-0.3	-0.7	-0.9	-1.2	-1.2
Wholesale/Retail Trade	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Finance, Insurance, Real Estate	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.6
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.3	0.1	-0.5	-0.9	-0.9	-1.3

Table II-11-CO-17. Colorado: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	.00	.03	.05	.10
Livestock		-0.6	-0.3	-0.2	-0.1
Other Crops		-2.3	-1.2	-0.8	-0.3
Livestock Feed		-10.5	-5.3	-3.4	-1.3
Misc. Agriculture		-0.2	-0.1	-0.1	0.0
Non-petroleum Mines		10.6	5.6	3.8	1.6
Petroleum & Gas Production		14.8	7.8	5.3	2.4
New Construction		5.7	3.0	2.0	0.9
Combined Manufacturing		7.2	3.8	2.6	1.1
Food Products		-1.0	-0.5	-0.4	-0.1
Wood Products		0.1	0.1	0.0	0.0
Petroleum & Coal Products		-1.0	-0.5	-0.3	-0.1
Transp, Comm, & Utilities		-1.2	-0.6	-0.4	-0.1
Recreation Services		-11.2	-5.8	-3.8	-1.5
Electric Power Production		-19.1	-9.8	-6.5	-2.6
Wholesale/Retail Trade		2.0	1.1	0.8	0.3
Finance, Insurance, Real Estate		-6.4	-3.1	-1.9	-0.6
Household and Business Services		0.6	0.3	0.2	0.1
Local Amusements		-0.1	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-12.8	-5.4	-3.0	-0.4

Table II-11-CO-18. Colorado: Personal Income Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	39.9	39.4	38.6	37.2	36.0	34.5	32.4
Other Crops	12.3	12.2	12.0	11.6	11.3	10.8	10.2
Livestock Feed	8.1	8.1	7.9	7.7	7.4	7.1	6.7
Misc. Agriculture	34.8	37.6	40.6	43.8	45.9	47.5	48.6
Non-petroleum Mines	71.8	71.0	71.1	70.2	69.2	67.7	65.0
Petroleum & Gas Production	44.2	42.4	41.7	40.5	39.4	38.1	36.6
New Construction	536.1	574.5	613.5	639.5	654.9	665.1	670.7
Combined Manufacturing	1344.5	1415.6	1460.8	1485.4	1496.3	1462.8	1419.3
Food Products	189.6	193.5	195.6	194.1	191.4	183.1	172.6
Wood Products	125.0	136.7	144.1	148.8	151.3	151.4	148.8
Petroleum & Coal Products	16.3	16.2	16.2	16.0	15.8	15.0	14.1
Transp, Comm, & Utilities	491.4	530.2	564.3	582.4	596.6	607.1	611.3
Recreation Services	558.8	618.6	674.9	725.6	760.0	784.2	801.3
Electric Power Production	55.1	60.3	64.4	66.8	68.1	68.7	67.9
Wholesale/Retail Trade	536.2	588.3	638.0	671.8	691.9	705.7	712.8
Finance, Insurance, Real Estate	464.2	507.0	544.0	569.9	587.2	596.0	596.2
Household and Business Services	824.0	899.5	974.6	1027.5	1061.3	1094.1	1127.4
Local Amusements	59.6	65.1	69.9	73.4	75.4	76.9	76.7
Health, Education, Social Services	578.9	640.8	700.4	743.1	767.6	779.2	781.5
Government Industries	1306.3	1388.6	1444.1	1477.3	1536.4	1544.1	1576.5
TOTAL	7297.2	7845.6	8316.6	8632.7	8863.6	8939.0	8976.7

Table II-11-CO-19. Colorado: Personal Income Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	39.9	39.4	38.6	37.2	36.0	34.5	32.3
Other Crops	12.3	12.2	11.9	11.5	11.2	10.6	10.0
Livestock Feed	8.1	8.1	7.8	7.6	7.2	6.8	6.4
Misc. Agriculture	34.8	37.6	40.6	43.7	45.9	47.4	48.5
Non-petroleum Mines	71.8	71.2	71.3	70.8	69.8	68.4	65.9
Petroleum & Gas Production	44.2	42.4	41.7	40.6	39.4	38.3	36.8
New Construction	536.1	575.1	614.5	641.0	656.9	667.7	673.8
Combined Manufacturing	1344.5	1416.2	1461.9	1487.2	1498.6	1465.5	1422.5
Food Products	189.6	193.5	195.6	194.1	191.4	183.1	172.5
Wood Products	125.0	136.8	144.1	148.8	151.4	151.5	148.8
Petroleum & Coal Products	16.3	16.2	16.2	16.0	15.7	15.0	14.1
Transp, Comm, & Utilities	491.4	530.2	564.3	582.3	596.5	606.9	611.1
Recreation Services	558.8	618.5	674.6	725.1	759.2	783.1	800.0
Electric Power Production	55.1	60.2	64.2	66.3	67.5	67.8	67.1
Wholesale/Retail Trade	536.2	588.3	638.0	671.9	692.0	705.8	712.8
Finance, Insurance, Real Estate	464.2	507.0	544.0	569.8	587.1	595.9	596.0
Household and Business Services	824.0	899.6	974.7	1027.7	1061.5	1094.4	1127.7
Local Amusements	59.6	65.1	69.9	73.4	75.4	76.9	76.7
Health, Education, Social Services	578.9	640.8	700.4	743.1	767.6	779.2	781.5
Government Industries	1306.3	1388.6	1444.1	1477.3	1536.4	1544.1	1576.5
TOTAL	7297.2	7846.8	8318.7	8635.3	8866.9	8942.9	8981.1

Table II-11-CO-20. Colorado: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
Livestock Feed	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.4
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Non-petroleum Mines	0.0	0.1	0.3	0.5	0.6	0.7	0.8
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.1	0.2	0.2
New Construction	0.0	0.5	1.0	1.5	2.1	2.6	3.1
Combined Manufacturing	0.0	0.6	1.2	1.7	2.3	2.8	3.2
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
Recreation Services	0.0	-0.1	-0.3	-0.6	-0.8	-1.0	-1.3
Electric Power Production	0.0	-0.1	-0.2	-0.5	-0.6	-0.9	-0.8
Wholesale/Retail Trade	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Finance, Insurance, Real Estate	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Household and Business Services	0.0	0.1	0.1	0.2	0.2	0.2	0.3
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	1.2	2.0	2.7	3.3	3.8	4.5

Table II-11-CO-21. Colorado: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	.00	.03	.05	.10
Livestock		-0.4	-0.2	-0.1	-0.1
Other Crops		-2.7	-1.3	-0.9	-0.3
Livestock Feed		-4.6	-2.3	-1.5	-0.6
Misc. Agriculture		-0.9	-0.5	-0.3	-0.1
Non-petroleum Mines		14.2	7.5	5.1	2.2
Petroleum & Gas Production		2.3	1.2	0.8	0.4
New Construction		48.3	25.6	17.4	7.6
Combined Manufacturing		52.4	28.0	19.1	8.3
Food Products		-0.5	-0.3	-0.2	-0.1
Wood Products		0.8	0.4	0.3	0.1
Petroleum & Coal Products		-0.4	-0.2	-0.1	0.0
Transp, Comm, & Utilities		-2.0	-1.0	-0.6	-0.2
Recreation Services		-18.1	-9.3	-6.2	-2.5
Electric Power Production		-13.5	-6.9	-4.6	-1.8
Wholesale/Retail Trade		1.6	0.9	0.6	0.3
Finance, Insurance, Real Estate		-1.9	-0.9	-0.6	-0.2
Household and Business Services		4.7	2.6	1.8	0.8
Local Amusements		-0.1	-0.1	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.2	-0.1	0.0	0.0
TOTAL		79.1	43.2	30.1	13.8

Table II-11-CO-22. Colorado: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	0.0035	0.0049	0.0055	0.0065
Earnings	0.2797	0.2788	0.2785	0.2779
Indirect Business Taxes	-0.0043	-0.0019	-0.0003	0.0030
Personal Income Taxes	0.2797	0.2788	0.2785	0.2779

E. Nevada State Impacts

1. Direct Impacts

The direct impacts for Nevada associated with implementing the requirements of the endangered fishes were described in detail by river basin in Chapter II-10. It is useful to summarize these impacts here since the set of overall impacts forms the inputs to the State I-O model. Table II-11-NV-1 reports the direct impact scenario. Negative direct impacts on the Nevada economy are projected to occur in the recreation sector.

Table II-11-NV-1. Direct Impacts for Nevada
(Listing and Critical Habitat)
(1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Recreation	0.0	-0.250	-0.500	-0.750	-1.000	-1.250
TOTAL	0.0	-0.250	-0.500	-0.750	-1.000	-1.250

The direct impacts for the Nevada economy arise from changes imposed on recreation activities on Lake Mead. The losses are projected to increase over time as shown in Table II-11-NV-1.

2. Output (Direct and Indirect) Impacts

a. Aggregate Output

Aggregate output in Nevada is projected to fall as a result of actions taken for endangered species protection and recovery. This effect follows from the negative direct impact in the recreation services sector, which leads to negative impacts elsewhere in the economy. By 2020 the aggregate output is projected to be $6.5 million below the without fish projections. This represents 0.016 percent of the projected aggregate output for the year 2020. The cumulative losses over the study period is $62.4 million (see Table II-11-NV-5).

b. Sectoral Output

(1) Recreation Services Sector

This is the only sector facing direct impacts under actions taken for the endangered fishes. The total output impacts for this sector are projected to be -$4.2 million by 2020 and this constitutes approximately two-thirds of the total output effects for the State economy (see Table II-11-NV-4).

(2) Other Effects

The indirect impacts from the recreation sector reductions appear in the finance, insurance, and real estate sector as well as the transportation, communications and utilities sector. There are smaller output effects in the household and business services sector (see Table II-11-NV-4).

3. Employment Impacts

a. Aggregate Employment

Associated with the reduction in output for Nevada is a similar reduction in aggregate employment. Table II-11-NV-8 reports the employment changes over time. By 2020 annual employment levels are 151 jobs below the without fish case. This loss constitutes 0.017 percent of the total employment in the State. The employment effects are negative and increasing throughout the period. Table II-11-NV-9 reports the incremental employment effects over the study period. Employment losses are projected to grow over time with larger absolute negative impacts in the 2015-2020 time period than in the 1995-2000 time period.

b. Sectoral Employment

(1) Recreation Services

The employment effects for this sector represent a large fraction of total State employment impacts. As Table II-11-NV-8 reports, the recreation sector negative impact of 94 jobs in 2020 is approximately two-thirds of the total impact of 151 jobs.

4. Earnings

a. Aggregate Earnings

The negative impacts to employment described above lead to loss of earnings in Nevada. These are presented in Table II-11-NV-12. By 2020, earnings are projected to be $2.8 million below the without fish scenario under the with fish scenario. Earnings losses amount to 0.016 percent of the total earning bill projected for 2020. The cumulative earnings impacts are presented in Table II-11-NV-13, which reports that this total is -$26.9 million with no discounting. At a 3 percent discount rate the impacts total -$12.8 million in present value.

5. Fiscal Effects

The loss in indirect business taxes is reported in Table II-11-NV-16. By 2020 the annual loss is projected to be -$0.4 million. Over the study period the total losses from this source of tax revenues are projected to total -$3.9 million (see Table II-11-NV-17, which also reports the cumulative losses in present value terms at various discount rates).

Personal income taxes are also projected to fall as a result of endangered species actions. By 2020 the impact is projected to be -$0.7 million. The total losses are reported in Table II-11-NV-20.

Summing the figures in Tables II-11-NV-17 and II-11-NV-21 yield total government revenue impacts of -$1.1 million annually by 2020. This amounts to 0.016 percent of the combined collections from personal income taxes and indirect business taxes.

6. Summary

The major impacts for the Nevada economy will be concentrated in service sector activities since these are linked with the recreation services sector. The output of the household and business services sector and the finance, insurance, and real estate sector have the larger negative impacts (Table II-11-NV-5), while many other sectors have much smaller negative impacts.

Table II-11-NV-22 reports the present values of the cumulative deviations from the without fish scenario for each of the macroeconomic aggregates. Total output over the study period is -0.0004 percent lower under the with fish scenario.

Table II-11-NV-2. Nevada: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	190.3	187.7	183.9	177.1	171.2	163.4	153.1
Other Crops	37.2	36.9	36.1	35.0	33.9	32.3	30.3
Livestock Feed	121.2	120.6	117.5	114.1	110.3	105.2	98.6
Misc. Agriculture	36.5	39.4	42.6	45.9	48.2	49.8	51.0
Non-petroleum Mines	1372.2	1357.0	1357.6	1341.5	1318.9	1288.6	1238.3
Petroleum & Gas Production	54.4	52.2	51.3	50.4	49.5	48.4	47.0
New Construction	3446.8	3694.3	3944.7	4111.6	4210.7	4276.8	4312.7
Combined Manufacturing	2207.0	2323.8	2397.9	2438.4	2456.2	2450.3	2443.7
Food Products	124.8	127.3	128.7	127.7	126.0	123.0	119.6
Wood Products	74.1	81.0	85.4	88.2	89.7	89.7	89.6
Petroleum & Coal Products	42.8	42.4	42.5	42.0	41.3	40.5	39.2
Transp, Comm, & Utilities	958.9	1034.6	1101.2	1136.4	1164.2	1184.6	1192.9
Recreation Services	9496.7	10512.9	11469.6	12332.1	12916.6	13327.4	13617.9
Electric Power Production	574.7	628.5	671.4	695.9	710.0	716.3	708.2
Wholesale/Retail Trade	1892.6	2076.3	2251.8	2371.3	2442.2	2490.8	2491.6
Finance, Insurance, Real Estate	3001.9	3278.0	3517.3	3684.8	3796.8	3853.7	3854.9
Household and Business Services	1356.3	1480.7	1604.3	1691.4	1747.1	1801.1	1862.3
Local Amusements	3064.5	3349.5	3597.4	3773.7	3879.3	3953.0	3961.7
Health, Education, Social Services	1614.1	1786.8	1952.9	2072.1	2140.4	2172.5	2179.1
Government Industries	1813.7	1928.0	2005.1	2051.2	2112.7	2155.0	2200.2
TOTAL	31480.7	34138.0	36559.4	38380.7	39565.3	40322.4	40691.8

Table II-11-NV-3. Nevada: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	190.3	187.7	183.9	177.1	171.2	163.4	153.1
Other Crops	37.2	36.9	36.1	35.0	33.9	32.3	30.3
Livestock Feed	121.2	120.6	117.5	114.1	110.3	105.2	98.6
Misc. Agriculture	36.5	39.4	42.6	45.9	48.2	49.8	51.0
Non-petroleum Mines	1372.2	1357.0	1357.6	1341.5	1318.9	1288.6	1238.3
Petroleum & Gas Production	54.4	52.2	51.3	50.4	49.5	48.3	46.9
New Construction	3446.8	3694.3	3944.7	4111.5	4210.6	4276.6	4312.5
Combined Manufacturing	2207.0	2323.8	2397.9	2438.4	2456.2	2450.3	2443.6
Food Products	124.8	127.3	128.7	127.7	125.9	123.0	119.6
Wood Products	74.1	81.0	85.4	88.2	89.6	89.7	89.5
Petroleum & Coal Products	42.8	42.4	42.5	42.0	41.3	40.5	39.2
Transp, Comm, & Utilities	958.9	1034.6	1101.2	1136.3	1164.0	1184.2	1192.4
Recreation Services	9496.7	10512.9	11469.3	12331.2	12914.9	13324.6	13613.7
Electric Power Production	574.7	628.5	671.4	695.9	709.9	716.1	708.0
Wholesale/Retail Trade	1892.6	2076.3	2251.8	2371.3	2442.2	2490.8	2491.6
Finance, Insurance, Real Estate	3001.9	3278.0	3517.3	3684.7	3796.6	3853.4	3854.4
Household and Business Services	1356.3	1480.7	1604.3	1691.4	1746.9	1800.8	1861.9
Local Amusements	3064.5	3349.5	3597.4	3773.7	3879.3	3953.0	3961.7
Health, Education, Social Services	1614.1	1786.8	1952.9	2072.1	2140.4	2172.5	2179.1
Government Industries	1813.7	1928.0	2005.1	2051.2	2112.7	2154.9	2200.2
TOTAL	31480.7	34138.0	36558.9	38379.5	39562.7	40318.1	40685.4

Table II-11-NV-4. Nevada: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Recreation Services	0.0	0.0	-0.3	-0.8	-1.7	-2.8	-4.2
Electric Power Production	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Household and Business Services	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
TOTAL	0.0	0.0	-0.4	-1.3	-2.6	-4.3	-6.5

Table II-11-NV-5. Nevada: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-0.1	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		-0.1	0.0	0.0	0.0
Non-petroleum Mines		0.0	0.0	0.0	0.0
Petroleum & Gas Production		-0.2	-0.1	-0.1	0.0
New Construction		-2.5	-1.2	-0.7	-0.3
Combined Manufacturing		-0.7	-0.3	-0.2	-0.1
Food Products		-0.2	-0.1	-0.1	0.0
Wood Products		-0.6	-0.3	-0.2	-0.1
Petroleum & Coal Products		-0.2	-0.1	-0.1	0.0
Transp, Comm, & Utilities		-4.7	-2.2	-1.4	-0.5
Recreation Services		-40.2	-19.1	-11.9	-4.1
Electric Power Production		-2.5	-1.2	-0.8	-0.3
Wholesale/Retail Trade		-0.3	-0.1	-0.1	0.0
Finance, Insurance, Real Estate		-4.5	-2.2	-1.4	-0.5
Household and Business Services		-4.4	-2.1	-1.3	-0.4
Local Amusements		-0.3	-0.1	-0.1	0.0
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-0.7	-0.3	-0.2	-0.1
TOTAL		-62.4	-29.7	-18.6	-6.3

Table II-11-NV-6. Nevada: Employment - Without Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	2245.6	2160.3	2110.6	2049.8	1985.5	1895.1	1775.7
Other Crops	1028.8	989.7	966.9	939.1	909.6	868.2	813.5
Livestock Feed	1634.8	1572.7	1536.5	1492.3	1445.4	1379.6	1292.7
Misc. Agriculture	2693.3	2908.8	3141.5	3386.2	3552.8	3670.0	3757.4
Non-petroleum Mines	18201.0	17838.8	17828.1	17617.7	17337.6	16938.8	16278.2
Petroleum & Gas Production	133.8	127.2	125.1	123.1	121.1	118.3	114.9
New Construction	40580.0	43493.6	46442.5	48407.0	49573.6	50351.9	50774.9
Combined Manufacturing	28644.7	30160.1	31122.2	31648.1	31879.2	31802.6	31716.8
Food Products	1799.8	1836.2	1856.2	1842.3	1816.8	1774.0	1725.4
Wood Products	5502.6	6017.6	6341.4	6549.4	6659.4	6663.4	6652.1
Petroleum & Coal Products	210.1	208.1	208.8	206.2	202.9	198.6	192.5
Transp, Comm, & Utilities	31443.6	33924.5	36109.2	37261.1	38174.0	38842.0	39113.9
Recreation Services	213702.8	236569.0	258096.8	277505.7	290659.5	299902.4	306440.3
Electric Power Production	6258.7	6844.6	7312.0	7578.9	7732.0	7800.8	7712.7
Wholesale/Retail Trade	83277.6	91363.9	99084.1	104345.5	107465.4	109604.0	109636.9
Finance, Insurance, Real Estate	29067.4	31741.6	34058.7	35679.9	36764.6	37316.1	37327.3
Household and Business Services	56052.6	61192.6	66302.2	69902.4	72202.2	74433.2	76964.0
Local Amusements	55094.5	60218.3	64674.4	67843.5	69743.1	71068.2	71224.6
Health, Education, Social Services	29771.3	32956.8	36021.8	38219.1	39480.4	40072.6	40192.8
Government Industries	74270.7	78949.7	82107.7	83996.2	86516.1	88246.4	90099.6
TOTAL	681613.6	741073.9	795446.7	836593.3	864221.0	882946.4	893805.9

Table II-11-NV-7. Nevada: Employment - With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	2245.6	2160.3	2110.6	2049.8	1985.4	1895.1	1775.6
Other Crops	1028.8	989.7	966.9	939.0	909.5	868.1	813.4
Livestock Feed	1634.8	1572.7	1536.5	1492.3	1445.4	1379.6	1292.7
Misc. Agriculture	2693.3	2908.8	3141.4	3386.0	3552.5	3669.5	3756.6
Non-petroleum Mines	18201.0	17838.8	17828.1	17617.7	17337.6	16938.8	16278.2
Petroleum & Gas Production	133.8	127.2	125.1	123.1	121.1	118.3	114.9
New Construction	40580.0	43493.6	46442.3	48406.4	49572.4	50349.9	50771.8
Combined Manufacturing	28644.7	30160.1	31122.1	31647.9	31878.8	31802.0	31715.9
Food Products	1799.8	1836.2	1856.2	1842.2	1816.7	1773.7	1725.0
Wood Products	5502.6	6017.6	6341.1	6548.4	6657.5	6660.2	6647.3
Petroleum & Coal Products	210.1	208.1	208.8	206.1	202.8	198.6	192.4
Transp, Comm, & Utilities	31443.6	33924.5	36108.2	37257.9	38167.6	38831.3	39097.9
Recreation Services	213702.8	236569.0	258090.8	277487.2	290622.1	299839.9	306346.3
Electric Power Production	6258.7	6844.6	7311.9	7578.4	7730.9	7798.9	7709.9
Wholesale/Retail Trade	83277.6	91363.9	99084.0	104345.2	107464.9	109603.0	109635.5
Finance, Insurance, Real Estate	29067.4	31741.6	34058.4	35679.0	36762.8	37313.0	37322.7
Household and Business Services	56052.6	61192.6	66301.0	69898.7	72194.7	74420.6	76944.8
Local Amusements	55094.5	60218.3	64674.4	67843.4	69742.9	71067.8	71224.0
Health, Education, Social Services	29771.3	32956.8	36021.8	38219.1	39480.3	40072.4	40192.6
Government Industries	74270.7	78949.7	82107.5	83995.6	86515.0	88244.5	90096.7
TOTAL	681613.6	741073.9	795437.0	836563.4	864160.6	882845.4	893654.2

Table II-11-NV-8. Nevada: Employment - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Other Crops	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	-0.1	-0.3	-0.5	-0.8
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	-0.2	-0.6	-1.2	-2.0	-3.0
Combined Manufacturing	0.0	0.0	-0.1	-0.2	-0.4	-0.6	-0.9
Food Products	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Wood Products	0.0	0.0	-0.3	-1.0	-1.9	-3.2	-4.8
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Transp, Comm, & Utilities	0.0	0.0	-1.0	-3.2	-6.4	-10.7	-16.0
Recreation Services	0.0	0.0	-6.0	-18.5	-37.4	-62.6	-94.0
Electric Power Production	0.0	0.0	-0.2	-0.6	-1.1	-1.9	-2.8
Wholesale/Retail Trade	0.0	0.0	-0.1	-0.3	-0.6	-0.9	-1.4
Finance, Insurance, Real Estate	0.0	0.0	-0.3	-0.9	-1.8	-3.0	-4.5
Household and Business Services	0.0	0.0	-1.2	-3.7	-7.5	-12.6	-19.2
Local Amusements	0.0	0.0	0.0	-0.1	-0.2	-0.4	-0.6
Health, Education, Social Services	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Government Industries	0.0	0.0	-0.2	-0.6	-1.1	-1.9	-2.8
TOTAL	0.0	0.0	-9.8	-29.9	-60.3	-101.0	-151.6

Table II-11-NV-9. Nevada: Jobs Available
(Listing and Critical Habitat)
(Number of Jobs)

CHANGE OF NUMBER OF JOBS AVAILABLE FOR FIVE INCREMENTAL YEARS

INDUSTRIAL SECTORS	1989-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	TOTAL
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.8
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	-0.2	-0.4	-0.6	-0.8	-1.0	-3.0
Combined Manufacturing	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.9
Food Products	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.3
Wood Products	0.0	-0.3	-0.6	-1.0	-1.3	-1.6	-4.8
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Transp, Comm, & Utilities	0.0	-1.0	-2.1	-3.2	-4.3	-5.3	-16.0
Recreation Services	0.0	-6.0	-12.5	-18.9	-25.2	-31.4	-94.0
Electric Power Production	0.0	-0.2	-0.4	-0.6	-0.8	-0.9	-2.8
Wholesale/Retail Trade	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-1.4
Finance, Insurance, Real Estate	0.0	-0.3	-0.6	-0.9	-1.2	-1.5	-4.5
Household and Business Services	0.0	-1.2	-2.5	-3.8	-5.1	-6.5	-19.2
Local Amusements	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.6
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2
Government Industries	0.0	-0.2	-0.4	-0.6	-0.8	-1.0	-2.8
TOTAL	0.0	-9.8	-20.1	-30.4	-40.7	-50.7	-151.6

Table II-11-NV-10. Nevada: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	14.9	14.7	14.4	13.8	13.4	12.8	12.0
Other Crops	5.4	5.3	5.2	5.0	4.9	4.7	4.4
Livestock Feed	6.5	6.5	6.3	6.1	5.9	5.6	5.3
Misc. Agriculture	33.0	35.7	38.6	41.6	43.7	45.1	46.2
Non-petroleum Mines	628.5	621.5	621.8	614.4	604.1	590.2	567.2
Petroleum & Gas Production	6.6	6.3	6.2	6.1	6.0	5.8	5.7
New Construction	1436.8	1539.9	1644.3	1713.9	1755.2	1782.7	1797.7
Combined Manufacturing	662.5	697.5	719.8	731.9	737.3	735.5	733.5
Food Products	27.3	27.9	28.2	28.0	27.6	26.9	26.2
Wood Products	92.2	100.8	106.2	109.7	111.5	111.6	111.4
Petroleum & Coal Products	6.3	6.2	6.2	6.2	6.1	5.9	5.7
Transp, Comm, & Utilities	886.5	956.4	1018.0	1050.5	1076.3	1095.1	1102.8
Recreation Services	3154.7	3492.3	3810.1	4096.6	4290.8	4427.2	4523.7
Electric Power Production	194.8	213.0	227.6	235.9	240.6	242.8	240.0
Wholesale/Retail Trade	995.3	1091.9	1184.2	1247.1	1284.4	1309.9	1310.3
Finance, Insurance, Real Estate	678.7	741.1	795.2	833.1	858.4	871.3	871.5
Household and Business Services	1245.1	1359.3	1472.8	1552.8	1603.9	1653.4	1709.7
Local Amusements	1121.9	1226.2	1316.9	1381.5	1420.1	1447.1	1450.3
Health, Education, Social Services	782.7	866.5	947.0	1004.8	1038.0	1053.5	1056.7
Government Industries	1813.8	1928.0	2005.2	2051.3	2112.8	2155.1	2200.3
TOTAL	13793.3	14937.1	15974.2	16730.2	17240.7	17582.4	17780.6

Table II-11-NV-11. Nevada: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	14.9	14.7	14.4	13.8	13.4	12.8	12.0
Other Crops	5.4	5.3	5.2	5.0	4.9	4.7	4.4
Livestock Feed	6.5	6.5	6.3	6.1	5.9	5.6	5.3
Misc. Agriculture	33.0	35.7	38.6	41.6	43.7	45.1	46.2
Non-petroleum Mines	628.5	621.5	621.8	614.4	604.1	590.2	567.2
Petroleum & Gas Production	6.6	6.3	6.2	6.1	6.0	5.8	5.7
New Construction	1436.8	1539.9	1644.3	1713.9	1755.1	1782.7	1797.6
Combined Manufacturing	662.5	697.5	719.8	731.9	737.3	735.5	733.5
Food Products	27.3	27.9	28.2	28.0	27.6	26.9	26.2
Wood Products	92.2	100.8	106.2	109.7	111.5	111.5	111.3
Petroleum & Coal Products	6.3	6.2	6.2	6.2	6.1	5.9	5.7
Transp, Comm, & Utilities	886.5	956.4	1018.0	1050.4	1076.1	1094.8	1102.3
Recreation Services	3154.7	3492.3	3810.0	4096.3	4290.2	4426.3	4522.3
Electric Power Production	194.8	213.0	227.6	235.9	240.6	242.7	239.9
Wholesale/Retail Trade	995.3	1091.9	1184.2	1247.1	1284.4	1309.9	1310.3
Finance, Insurance, Real Estate	678.7	741.1	795.2	833.1	858.4	871.2	871.4
Household and Business Services	1245.1	1359.3	1472.8	1552.7	1603.7	1653.2	1709.2
Local Amusements	1121.9	1226.2	1316.9	1381.5	1420.1	1447.1	1450.3
Health, Education, Social Services	782.7	866.5	947.0	1004.8	1038.0	1053.5	1056.7
Government Industries	1813.8	1928.0	2005.2	2051.3	2112.8	2155.0	2200.3
TOTAL	13793.3	14937.1	15974.0	16729.6	17239.6	17580.5	17777.8

Table II-11-NV-12. Nevada: Earnings - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Recreation Services	0.0	0.0	-0.1	-0.3	-0.6	-0.9	-1.4
Electric Power Production	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Household and Business Services	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.4
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
TOTAL	0.0	0.0	-0.2	-0.6	-1.1	-1.9	-2.8

Table II-11-NV-13. Nevada: Earnings - Present Values of Differences by Sector
(Listing and Critical Habitat)
(1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		-0.1	0.0	0.0	0.0
Non-petroleum Mines		0.0	0.0	0.0	0.0
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		-1.0	-0.5	-0.3	-0.1
Combined Manufacturing		-0.2	-0.1	-0.1	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		-0.8	-0.4	-0.2	-0.1
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		-4.4	-2.1	-1.3	-0.4
Recreation Services		-13.3	-6.3	-4.0	-1.3
Electric Power Production		-0.9	-0.4	-0.3	-0.1
Wholesale/Retail Trade		-0.2	-0.1	0.0	0.0
Finance, Insurance, Real Estate		-1.0	-0.5	-0.3	-0.1
Household and Business Services		-4.1	-1.9	-1.2	-0.4
Local Amusements		-0.1	-0.1	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.7	-0.3	-0.2	-0.1
TOTAL		-26.9	-12.8	-8.0	-2.7

Table II-11-NV-14. Nevada: Indirect Business Tax - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts						
	1989	1995	2000	2005	2010	2015	2020
Livestock	6.5	6.4	6.3	6.0	5.8	5.6	5.2
Other Crops	0.6	0.6	0.6	0.6	0.6	0.5	0.5
Livestock Feed	3.5	3.5	3.4	3.3	3.2	3.0	2.8
Misc. Agriculture	1.0	1.1	1.1	1.2	1.3	1.3	1.4
Non-petroleum Mines	153.6	151.9	152.0	150.2	147.7	144.3	138.6
Petroleum & Gas Production	8.5	8.2	8.1	7.9	7.8	7.6	7.4
New Construction	48.5	52.0	55.5	57.8	59.2	60.2	60.7
Combined Manufacturing	34.0	35.8	37.0	37.6	37.9	37.8	37.7
Food Products	1.1	1.1	1.1	1.1	1.1	1.1	1.0
Wood Products	1.2	1.3	1.4	1.4	1.4	1.4	1.4
Petroleum & Coal Products	2.3	2.2	2.2	2.2	2.2	2.1	2.1
Transp, Comm, & Utilities	60.5	65.3	69.5	71.7	73.5	74.8	75.3
Recreation Services	591.9	655.2	714.9	768.6	805.1	830.7	848.8
Electric Power Production	33.4	36.5	39.0	40.4	41.3	41.6	41.2
Wholesale/Retail Trade	354.8	389.2	422.1	444.6	457.8	467.0	467.1
Finance, Insurance, Real Estate	487.9	532.8	571.7	598.9	617.1	626.4	626.6
Household and Business Services	22.8	24.9	26.9	28.4	29.3	30.2	31.3
Local Amusements	222.2	242.9	260.9	273.6	281.3	286.6	287.3
Health, Education, Social Services	5.9	6.5	7.1	7.5	7.8	7.9	7.9
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2040.2	2217.4	2380.7	2503.2	2581.3	2630.1	2644.2

Table II-11-NV-15. Nevada: Indirect Business Tax - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts						
	1989	1995	2000	2005	2010	2015	2020
Livestock	6.5	6.4	6.3	6.0	5.8	5.6	5.2
Other Crops	0.6	0.6	0.6	0.6	0.6	0.5	0.5
Livestock Feed	3.5	3.5	3.4	3.3	3.2	3.0	2.8
Misc. Agriculture	1.0	1.1	1.1	1.2	1.3	1.3	1.4
Non-petroleum Mines	153.6	151.9	152.0	150.2	147.7	144.3	138.6
Petroleum & Gas Production	8.5	8.2	8.1	7.9	7.8	7.6	7.4
New Construction	48.5	52.0	55.5	57.8	59.2	60.2	60.7
Combined Manufacturing	34.0	35.8	37.0	37.6	37.9	37.8	37.7
Food Products	1.1	1.1	1.1	1.1	1.1	1.1	1.0
Wood Products	1.2	1.3	1.4	1.4	1.4	1.4	1.4
Petroleum & Coal Products	2.3	2.2	2.2	2.2	2.2	2.1	2.1
Transp, Comm, & Utilities	60.5	65.3	69.5	71.7	73.5	74.7	75.3
Recreation Services	591.9	655.2	714.8	768.6	805.0	830.5	848.5
Electric Power Production	33.4	36.5	39.0	40.4	41.3	41.6	41.1
Wholesale/Retail Trade	354.8	389.2	422.1	444.6	457.8	467.0	467.1
Finance, Insurance, Real Estate	487.9	532.8	571.7	598.9	617.1	626.3	626.5
Household and Business Services	22.8	24.9	26.9	28.4	29.3	30.2	31.3
Local Amusements	222.2	242.9	260.8	273.6	281.3	286.6	287.3
Health, Education, Social Services	5.9	6.5	7.1	7.5	7.8	7.9	7.9
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2040.2	2217.4	2380.7	2503.1	2581.1	2629.8	2643.8

Table II-11-NV-16. Nevada: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.4

Table II-11-NV-17. Nevada: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		0.0	0.0	0.0	0.0
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		0.0	0.0	0.0	0.0
Combined Manufacturing		0.0	0.0	0.0	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		-0.3	-0.1	-0.1	0.0
Recreation Services		-2.5	-1.2	-0.7	-0.3
Electric Power Production		-0.1	-0.1	0.0	0.0
Wholesale/Retail Trade		-0.1	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.7	-0.4	-0.2	-0.1
Household and Business Services		-0.1	0.0	0.0	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-3.9	-1.9	-1.2	-0.4

Table II-11-NV-18. Nevada: Personal Income Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	3.7	3.7	3.6	3.5	3.3	3.2	3.0
Other Crops	1.3	1.3	1.3	1.3	1.2	1.2	1.1
Livestock Feed	1.6	1.6	1.6	1.5	1.5	1.4	1.3
Misc. Agriculture	8.3	8.9	9.6	10.4	10.9	11.3	11.5
Non-petroleum Mines	157.1	155.4	155.4	153.6	151.0	147.5	141.8
Petroleum & Gas Production	1.6	1.6	1.5	1.5	1.5	1.5	1.4
New Construction	359.2	385.0	411.1	428.5	438.8	445.7	449.4
Combined Manufacturing	165.6	174.4	179.9	183.0	184.3	183.9	183.4
Food Products	6.8	7.0	7.0	7.0	6.9	6.7	6.5
Wood Products	23.0	25.2	26.5	27.4	27.9	27.9	27.9
Petroleum & Coal Products	1.6	1.6	1.6	1.5	1.5	1.5	1.4
Transp, Comm, & Utilities	221.6	239.1	254.5	262.6	269.1	273.8	275.7
Recreation Services	788.7	873.1	952.5	1024.1	1072.7	1106.8	1130.9
Electric Power Production	48.7	53.3	56.9	59.0	60.2	60.7	60.0
Wholesale/Retail Trade	248.8	273.0	296.1	311.8	321.1	327.5	327.6
Finance, Insurance, Real Estate	169.7	185.3	198.8	208.3	214.6	217.8	217.9
Household and Business Services	311.3	339.8	368.2	388.2	401.0	413.4	427.4
Local Amusements	280.5	306.5	329.2	345.4	355.0	361.8	362.6
Health, Education, Social Services	195.7	216.6	236.8	251.2	259.5	263.4	264.2
Government Industries	453.4	482.0	501.3	512.8	528.2	538.8	550.1
TOTAL	3448.3	3734.3	3993.5	4182.5	4310.2	4395.6	4445.1

Table II-11-NV-19. Nevada: Personal Income Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	3.7	3.7	3.6	3.5	3.3	3.2	3.0
Other Crops	1.3	1.3	1.3	1.3	1.2	1.2	1.1
Livestock Feed	1.6	1.6	1.6	1.5	1.5	1.4	1.3
Misc. Agriculture	8.3	8.9	9.6	10.4	10.9	11.3	11.5
Non-petroleum Mines	157.1	155.4	155.4	153.6	151.0	147.5	141.8
Petroleum & Gas Production	1.6	1.6	1.5	1.5	1.5	1.5	1.4
New Construction	359.2	385.0	411.1	428.5	438.8	445.7	449.4
Combined Manufacturing	165.6	174.4	179.9	183.0	184.3	183.9	183.4
Food Products	6.8	7.0	7.0	7.0	6.9	6.7	6.5
Wood Products	23.0	25.2	26.5	27.4	27.9	27.9	27.8
Petroleum & Coal Products	1.6	1.6	1.6	1.5	1.5	1.5	1.4
Transp, Comm, & Utilities	221.6	239.1	254.5	262.6	269.0	273.7	275.6
Recreation Services	788.7	873.1	952.5	1024.1	1072.6	1106.6	1130.6
Electric Power Production	48.7	53.3	56.9	59.0	60.2	60.7	60.0
Wholesale/Retail Trade	248.8	273.0	296.1	311.8	321.1	327.5	327.6
Finance, Insurance, Real Estate	169.7	185.3	198.8	208.3	214.6	217.8	217.9
Household and Business Services	311.3	339.8	368.2	388.2	400.9	413.3	427.3
Local Amusements	280.5	306.5	329.2	345.4	355.0	361.8	362.6
Health, Education, Social Services	195.7	216.6	236.8	251.2	259.5	263.4	264.2
Government Industries	453.4	482.0	501.3	512.8	528.2	538.8	550.1
TOTAL	3448.3	3734.3	3993.5	4182.4	4309.9	4395.1	4444.4

Table II-11-NV-20. Nevada: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Recreation Services	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	-0.1	-0.3	-0.5	-0.7

Table II-11-NV-21. Nevada: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		0.0	0.0	0.0	0.0
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		0.0	0.0	0.0	0.0
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		-0.3	-0.1	-0.1	0.0
Combined Manufacturing		-0.1	0.0	0.0	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		-0.2	-0.1	-0.1	0.0
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		-1.1	-0.5	-0.3	-0.1
Recreation Services		-3.3	-1.6	-1.0	-0.3
Electric Power Production		-0.2	-0.1	-0.1	0.0
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.3	-0.1	-0.1	0.0
Household and Business Services		-1.0	-0.5	-0.3	-0.1
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.2	-0.1	0.0	0.0
TOTAL		-6.7	-3.2	-2.0	-0.7

Table II-11-NV-22. Nevada: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.0052	-0.0040	-0.0033	-0.0019
Earnings	-0.0052	-0.0039	-0.0032	-0.0019
Indirect Business Taxes	-0.0051	-0.0039	-0.0032	-0.0018
Personal Income Taxes	-0.0052	-0.0039	-0.0032	-0.0019

F. New Mexico State Impacts

1. Direct Impacts

The direct impacts for New Mexico associated with implementing the requirements of the endangered fishes were described in detail in Chapter II-9. It is useful to summarize these impacts here since these are the inputs to the State I-O model. Table II-11-NM-1 reports this input scenario. Negative direct impacts on the New Mexico economy are projected to occur in the agriculture sector and the electric power sector. There are no offsetting positive impacts projected.

Table II-11-NM-1. Direct Impacts for New Mexico
(Listing and Critical Habitat)
(1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Livestock Feed	-1.433	-2.866	-7.451	-11.033	-17.052	-22.640
Electric Power	-0.293	-0.314	-0.307	-0.299	-0.295	-0.326
TOTAL	-1.726	-3.180	-7.758	-11.332	-17.347	-22.966

A few points may be made concerning the direct impacts. First, the agriculture impacts in the above table are based on projections that forego further depletions in the San Juan. These foregone depletions are projected to amount to 133,000 acre-feet. Based on regional cropping patterns in northwestern New Mexico, the dollar impacts are those shown in Table II-11-NM-1.[68]

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[68] If the projected cropping patterns are used instead, the dollar values are given as:

	Year					
Sector	1995	2000	2005	2010	2015	2020
Other Crops	-2.238	-4.476	-11.638	-16.932	-26.633	-35.360
Livestock Feed	-0.954	-1.907	-4.957	-7.340	-11.345	-15.063

Second, electric power output falls and the per unit cost is projected by Stone and Webster Consultants, Inc. to increase. The increase is due to the use of substitute fuels (coal and gas), which is a more costly means of meeting the peak load requirements than the use of hydroelectric generation.

Finally, the arithmetic sum of the direct impacts over the study period is negative. It is important to note that the impacts are projected to be larger towards the end of the study period.

2. Output (Direct and Indirect) Impacts

a. Aggregate Output

Aggregate output is projected to fall in New Mexico as a result of the actions taken on behalf of the endangered species. From a -$2.5 million total impact in 1995, the output overall impacts are projected to increase to an annual loss of -$89.1 million by the year 2020 (see Table II-11-NM-54. To place this loss in perspective, the total figures can be expressed as a percentage of the total output that is projected to occur in the absence of actions taken on behalf of the fishes. By 2020 the total losses amount to 0.2 percent of New Mexico's projected aggregate output.

The arithmetic sum of the total losses is -$879 million over the study period (see Table II-11-NM-4). The present value of these losses is -$425 million at a 3 percent discount rate (-$270 million if the discount rate is raised to 5 percent).

b. Sectoral Output

(1) Agricultural Sectors

The largest share of the direct impacts occurs in the livestock feed sector due to restrictions on future depletions in the San Juan basin. The total effect on output in this sector in 1995 is an impact of -$1.5 million in output. This impact increases over time until it reaches -$59 million by 2020. This negative impact represents a reduction of 21 percent of the without fish levels of output for the year 2020.

(2) Electric Power Sector

Electric power production is projected to decline for the supplies to the city of Farmington. The overall effect in the electric power industry for the State is a -$3 million change in output by the year 2020 (see Table II-11-NM-4). It is important to note that the bulk of these negative impacts are the indirect effects due to the effect of other impacts. In fact, the total (direct plus indirect) impacts minus the pure direct impacts amounts to -$2.67 million as the amount due to the linkage effects in the economy.

c. Purely Indirect Effects

The livestock sector is projected to experience indirect output effects and the output in this sector is projected to decline relative to the without fish scenario by $2.8 million in 2020. Indirect effects will also be felt in the miscellaneous agriculture sector and the output in this sector is projected to decline by $0.8 million in 2020. The direct impacts in the New Mexico economy ripple through the other sectors to yield reductions in output. There are notable output declines in various service sectors (wholesale and retail trade; finance, insurance and real estate; household and business services) as well as new construction and combined manufacturing (see Table II-11-NM-4).

2. Employment

a. Aggregate Employment

Employment effects are reported in Tables II-11-NM-6 through II-11-NM-9. Since total output is projected to fall as a result of endangered species it follows that employment is also projected to fall. The annual employment is projected to fall by 22.7 persons in 1995. This number increases over time until it reaches 855 by the year 2020. By the year 2020, the impacts of endangered fishes are projected to reduce the number of jobs in the New Mexico economy by 0.1 percent. The incremental jobs foregone are reported for five-year intervals in Table II-11-NM-9. This table shows that the employment effects of endangered species impacts grow over time. For reasons noted earlier in this chapter, this is an overstatement of the likely impacts.

b. Sectoral Employment

(1) Agricultural Sectors

Employment is projected to decline in the livestock feed sector and is projected to be lower by some 542 jobs by the year 2020 (Table II-11-NM-8). The initial declines begin in 1995 when the output in this sector is projected to fall.

(2) Livestock Sectors

Employment is projected to decline by 28.5 jobs by the year 2020 (Table II-11-NM-9). The largest declines are in later years.

4. Earnings

a. Aggregate Earnings

Total earnings impacts are negative throughout the study period consistent with the aggregate employment decline during the study period (see Tables II-11-NM-10 to II-11-NM-13). By 2020 the total earnings are projected to be $7.1 million less in the with fish scenario than in the without fish scenario. This amounts to a 0.06 percent loss. The earnings loss is relatively less than the employment reduction since most of the direct losses are projected to arise in lower earning sectors such as the livestock feed sector and various service sectors.

b. Sectoral Earnings

(1) Agricultural Sectors

The livestock feed sector is projected to have negative impacts in earnings. Table II-11-NM-12 reports that earnings in the livestock feed sector will be $2.0 million less than in the without fish scenario in 2020. Overall, the earnings impacts are -$7.1 million.

Cumulative impacts over the study period are reported in Table II-11-NM-13. The accumulated losses in earnings for the economy is $70.5million. The present value of this stream of losses is -$34.2 million at a 3 percent discount rate.

5. Fiscal Impacts

Fiscal impacts are captured in the impacts on indirect business taxes as well as personal income taxes (see Tables II-11-NM-14 to II-11-NM-21). After the direct impacts due to endangered species have worked through the economy, indirect business taxes are projected to be 4.2 million lower than they would have been by the year 2020. Over the entire study period the cumulative losses are -$41.4 million as a straight sum. Discounted at 3 percent these losses are -$20.1 million and at 5 percent are 12.8 million. Personal income taxes are projected to decline by 1.8 million by the year 2020. The cumulative losses are 17.6 million.

The total effect on government revenues are a loss of $6 million in annual revenues by the year 2020.

6. Summary

The losses due to endangered species grow over time as the impacts in the livestock feed sector mount. While this is the projection of the I-O model it must be remembered that these models maintain a static representation of the industrial structure of the economy. Thus, the projected losses arise under an assumption that there are no structural shifts in the economy. It is likely that such shifts would occur in response to the continued losses in the livestock feed sector. In that sense, the losses stated above are an overstatement of the total losses to the New Mexico economy.

Table II-11-NM-22 reports the deviations from the without fish scenario. The present value of the with fish stream of output over the study period is -0.0545 percent lower than in the without fish scenario (at a 3 percent discount rate).

Table II-11-NM-2. New Mexico: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	878.6	866.4	848.9	817.2	790.0	754.1	691.5
Other Crops	240.4	238.7	233.7	226.0	219.2	209.0	191.6
Livestock Feed	352.5	351.0	341.9	332.1	321.0	306.1	280.7
Misc. Agriculture	114.3	123.6	133.5	143.9	151.1	156.1	159.8
Non-petroleum Mines	776.5	767.9	768.2	759.1	746.3	727.7	684.7
Petroleum & Gas Production	7114.7	6826.9	6714.3	6524.1	6342.5	6133.8	5895.8
New Construction	2740.7	2937.4	3136.6	3269.3	3348.1	3400.6	3372.1
Combined Manufacturing	3134.9	3300.7	3406.0	3463.6	3488.9	3497.3	3506.7
Food Products	461.8	471.1	476.3	479.8	481.6	483.4	486.1
Wood Products	429.2	469.3	494.6	510.8	519.4	519.1	510.1
Petroleum & Coal Products	2018.3	1999.4	2005.8	2000.3	1997.1	1988.0	1975.6
Transp, Comm, & Utilities	2173.7	2345.2	2496.3	2575.9	2639.0	2685.2	2666.4
Recreation Services	1775.7	1965.7	2144.6	2305.9	2415.2	2492.0	2546.3
Electric Power Production	1446.8	1582.2	1690.3	1752.0	1787.4	1803.3	1782.9
Wholesale/Retail Trade	1691.6	1855.9	2012.7	2119.6	2183.0	2226.4	2225.7
Finance, Insurance, Real Estate	2642.6	2885.7	3096.3	3243.7	3342.3	3392.4	3393.5
Household and Business Services	2695.4	2942.6	3188.3	3361.4	3472.0	3579.3	3591.5
Local Amusements	168.9	184.6	198.2	207.9	213.8	217.8	222.6
Health, Education, Social Services	1820.2	2015.0	2202.4	2336.7	2413.9	2450.1	2457.4
Government Industries	2676.4	2845.0	2958.8	3026.8	3057.1	3072.4	3136.9
TOTAL	35353.2	36974.3	38547.6	39456.3	39928.8	40093.9	39778.0

Table II-11-NM-3. New Mexico: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	878.6	866.3	848.7	816.7	789.0	752.2	688.7
Other Crops	240.4	238.7	233.6	226.0	219.1	208.9	191.5
Livestock Feed	352.5	349.5	337.6	320.2	298.3	267.0	221.7
Misc. Agriculture	114.3	123.6	133.4	143.7	150.8	155.6	159.0
Non-petroleum Mines	776.5	767.9	768.1	759.0	746.1	727.3	684.2
Petroleum & Gas Production	7114.7	6826.8	6713.9	6523.0	6340.5	6130.5	5890.8
New Construction	2740.7	2937.4	3136.5	3268.9	3347.4	3399.6	3370.5
Combined Manufacturing	3134.9	3300.7	3405.9	3463.2	3488.2	3496.1	3504.8
Food Products	461.8	471.1	476.2	479.8	481.6	483.2	485.9
Wood Products	429.2	469.3	494.6	510.8	519.4	519.0	509.9
Petroleum & Coal Products	2018.3	1999.2	2005.4	1999.6	1995.7	1985.5	1971.9
Transp, Comm, & Utilities	2173.7	2345.2	2496.1	2575.5	2638.2	2683.8	2664.3
Recreation Services	1775.7	1965.7	2144.6	2305.8	2415.0	2491.6	2545.8
Electric Power Production	1446.8	1581.9	1689.6	1750.8	1785.7	1801.0	1779.9
Wholesale/Retail Trade	1691.6	1855.9	2012.7	2119.5	2182.8	2226.1	2225.3
Finance, Insurance, Real Estate	2642.6	2885.5	3096.0	3242.7	3340.5	3389.2	3388.5
Household and Business Services	2695.4	2942.6	3188.2	3361.1	3471.4	3578.1	3589.6
Local Amusements	168.9	184.6	198.2	207.9	213.8	217.8	222.6
Health, Education, Social Services	1820.2	2015.0	2202.4	2336.7	2413.8	2450.0	2457.3
Government Industries	2676.4	2845.0	2958.8	3026.8	3057.0	3072.3	3136.7
TOTAL	35353.2	36971.8	38540.4	39437.8	39894.1	40034.9	39688.9

Table II-11-NM-4. New Mexico: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	-0.1	-0.2	-0.6	-1.1	-1.8	-2.8
Other Crops	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Livestock Feed	0.0	-1.5	-4.4	-11.9	-22.7	-39.1	-59.0
Misc. Agriculture	0.0	0.0	-0.1	-0.1	-0.3	-0.5	-0.8
Non-petroleum Mines	0.0	0.0	-0.1	-0.1	-0.2	-0.4	-0.5
Petroleum & Gas Production	0.0	-0.2	-0.4	-1.1	-2.0	-3.3	-5.0
New Construction	0.0	-0.1	-0.1	-0.3	-0.6	-1.1	-1.6
Combined Manufacturing	0.0	0.0	-0.1	-0.4	-0.7	-1.2	-1.9
Food Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Wood Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Petroleum & Coal Products	0.0	-0.1	-0.3	-0.8	-1.4	-2.4	-3.8
Transp, Comm, & Utilities	0.0	-0.1	-0.2	-0.4	-0.8	-1.4	-2.1
Recreation Services	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Electric Power Production	0.0	-0.3	-0.7	-1.2	-1.7	-2.3	-3.0
Wholesale/Retail Trade	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Finance, Insurance, Real Estate	0.0	-0.1	-0.4	-1.0	-1.9	-3.2	-5.0
Household and Business Services	0.0	0.0	-0.1	-0.4	-0.7	-1.2	-1.9
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Government Industries	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
TOTAL	0.0	-2.5	-7.2	-18.5	-34.8	-59.1	-89.1

Table II-11-NM-5. New Mexico: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-27.1	-13.1	-8.3	-2.9
Other Crops		-1.8	-0.9	-0.6	-0.2
Livestock Feed		-575.5	-277.1	-175.4	-62.4
Misc. Agriculture		-7.3	-3.5	-2.2	-0.8
Non-petroleum Mines		-5.5	-2.7	-1.7	-0.6
Petroleum & Gas Production		-50.1	-24.3	-15.5	-5.6
New Construction		-16.0	-7.8	-5.0	-1.8
Combined Manufacturing		-17.8	-8.6	-5.4	-1.9
Food Products		-2.0	-1.0	-0.6	-0.2
Wood Products		-1.3	-0.6	-0.4	-0.1
Petroleum & Coal Products		-36.7	-17.7	-11.3	-4.1
Transp, Comm, & Utilities		-20.4	-9.9	-6.3	-2.3
Recreation Services		-4.9	-2.4	-1.5	-0.5
Electric Power Production		-40.2	-20.7	-13.9	-5.7
Wholesale/Retail Trade		-4.3	-2.1	-1.3	-0.5
Finance, Insurance, Real Estate		-47.5	-22.8	-14.4	-5.1
Household and Business Services		-17.7	-8.5	-5.4	-1.9
Local Amusements		-0.3	-0.1	-0.1	0.0
Health, Education, Social Services		-0.8	-0.4	-0.2	-0.1
Government Industries		-1.9	-0.9	-0.6	-0.2
TOTAL		-879.1	-425.1	-270.1	-97.1

Table II-11-NM-6. New Mexico: Employment - Without Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	9142.1	8794.7	8592.4	8345.0	8082.9	7715.2	7074.8
Other Crops	5578.7	5366.7	5243.2	5092.2	4932.3	4707.9	4317.2
Livestock Feed	3332.7	3206.0	3132.3	3042.1	2946.6	2812.5	2579.1
Misc. Agriculture	6184.0	6678.8	7213.1	7774.9	8157.5	8426.7	8627.2
Non-petroleum Mines	9144.3	8962.4	8957.0	8851.3	8710.6	8492.8	7991.7
Petroleum & Gas Production	10073.2	9579.6	9421.6	9172.8	8935.3	8641.3	8306.0
New Construction	40461.4	43366.5	46306.7	48265.5	49428.7	50204.7	49783.0
Combined Manufacturing	36517.6	38449.3	39675.9	40346.4	40640.9	40738.5	40848.4
Food Products	4272.3	4358.6	4406.1	4439.1	4456.0	4472.0	4497.5
Wood Products	7358.0	8046.7	8479.6	8757.7	8904.9	8899.5	8744.7
Petroleum & Coal Products	1488.6	1474.6	1479.3	1475.3	1473.0	1466.2	1457.1
Transp, Comm, & Utilities	20152.3	21742.3	23142.5	23880.8	24465.9	24894.0	24719.8
Recreation Services	56303.0	62327.5	67999.3	73112.8	76578.3	79013.5	80736.0
Electric Power Production	7101.3	7765.9	8296.3	8599.2	8772.9	8850.9	8750.9
Wholesale/Retail Trade	90979.9	99814.0	108248.3	113996.3	117404.8	119741.2	119705.2
Finance, Insurance, Real Estate	20302.5	22170.4	23788.8	24921.1	25678.7	26063.9	26071.7
Household and Business Services	67751.0	73963.8	80139.8	84491.4	87271.2	89967.8	90273.7
Local Amusements	6108.4	6676.4	7170.5	7521.9	7732.5	7879.4	8052.7
Health, Education, Social Services	52956.3	58622.6	64074.5	67983.0	70226.5	71279.9	71493.7
Government Industries	130759.3	138997.1	144557.0	147881.8	149360.6	150107.5	153259.7
TOTAL	585966.7	630363.9	670324.2	697950.7	714159.9	724375.3	727290.2

Table II-11-NM-7. New Mexico: Employment - With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	9142.1	8794.0	8590.3	8339.3	8072.0	7696.3	7046.3
Other Crops	5578.7	5366.6	5242.9	5091.4	4930.7	4705.1	4312.9
Livestock Feed	3332.7	3192.6	3092.4	2933.5	2737.8	2453.1	2036.8
Misc. Agriculture	6184.0	6677.8	7210.2	7767.1	8142.2	8399.9	8585.3
Non-petroleum Mines	9144.3	8962.1	8956.3	8849.8	8708.0	8488.6	7985.5
Petroleum & Gas Production	10073.2	9579.4	9420.9	9171.3	8932.5	8636.6	8298.9
New Construction	40461.4	43365.7	46304.6	48260.4	49419.4	50189.0	49759.2
Combined Manufacturing	36517.6	38448.8	39674.3	40342.2	40632.9	40724.5	40826.6
Food Products	4272.3	4358.5	4405.9	4438.7	4455.3	4470.8	4495.6
Wood Products	7358.0	8046.6	8479.4	8757.2	8904.0	8898.0	8742.4
Petroleum & Coal Products	1488.6	1474.5	1479.1	1474.8	1471.9	1464.4	1454.3
Transp, Comm, & Utilities	20152.3	21741.7	23140.9	23876.8	24458.4	24881.4	24700.6
Recreation Services	56303.0	62327.0	67998.0	73109.6	76572.3	79003.1	80719.9
Electric Power Production	7101.3	7764.4	8292.9	8593.4	8764.6	8839.6	8736.2
Wholesale/Retail Trade	90979.9	99813.5	108246.6	113991.6	117395.7	119725.3	119680.7
Finance, Insurance, Real Estate	20302.5	22169.5	23786.1	24913.8	25664.5	26039.2	26033.5
Household and Business Services	67751.0	73962.7	80136.4	84482.3	87253.8	89937.7	90227.2
Local Amusements	6108.4	6676.4	7170.4	7521.7	7732.1	7878.7	8051.7
Health, Education, Social Services	52956.3	58622.5	64074.3	67982.6	70225.6	71278.3	71491.3
Government Industries	130759.3	138996.9	144556.3	147879.9	149357.1	150101.4	153250.3
TOTAL	585966.7	630341.2	670258.2	697777.4	713830.5	723811.1	726435.3

Table II-11-NM-8. New Mexico: Employment - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (Number of Persons)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	-0.7	-2.1	-5.7	-11.0	-18.9	-28.5
Other Crops	0.0	-0.1	-0.3	-0.8	-1.6	-2.8	-4.2
Livestock Feed	0.0	-13.4	-39.9	-108.6	-208.7	-359.4	-542.3
Misc. Agriculture	0.0	-0.9	-2.8	-7.8	-15.3	-26.8	-41.9
Non-petroleum Mines	0.0	-0.3	-0.7	-1.5	-2.6	-4.2	-6.2
Petroleum & Gas Production	0.0	-0.2	-0.6	-1.5	-2.8	-4.7	-7.1
New Construction	0.0	-0.8	-2.1	-5.1	-9.3	-15.7	-23.8
Combined Manufacturing	0.0	-0.5	-1.6	-4.2	-8.1	-14.0	-21.8
Food Products	0.0	0.0	-0.1	-0.4	-0.7	-1.2	-2.0
Wood Products	0.0	-0.1	-0.2	-0.5	-0.9	-1.5	-2.3
Petroleum & Coal Products	0.0	-0.1	-0.2	-0.6	-1.1	-1.8	-2.8
Transp, Comm, & Utilities	0.0	-0.6	-1.7	-4.0	-7.4	-12.6	-19.1
Recreation Services	0.0	-0.4	-1.3	-3.2	-6.1	-10.4	-16.1
Electric Power Production	0.0	-1.6	-3.5	-5.8	-8.3	-11.3	-14.7
Wholesale/Retail Trade	0.0	-0.6	-1.8	-4.7	-9.1	-15.8	-24.5
Finance, Insurance, Real Estate	0.0	-0.9	-2.7	-7.4	-14.2	-24.7	-38.3
Household and Business Services	0.0	-1.1	-3.4	-9.1	-17.3	-30.2	-46.5
Local Amusements	0.0	0.0	-0.1	-0.2	-0.4	-0.7	-1.0
Health, Education, Social Services	0.0	-0.1	-0.2	-0.5	-0.9	-1.5	-2.4
Government Industries	0.0	-0.3	-0.7	-1.9	-3.5	-6.0	-9.4
TOTAL	0.0	-22.7	-66.0	-173.3	-329.4	-564.2	-855.0

Table II-11-NM-9. New Mexico: Jobs Available (Listing and Critical Habitat) (Number of Jobs)

INDUSTRIAL SECTORS	CHANGE IN NUMBER OF JOBS FOR FIVE INCREMENTAL YEARS 1989-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	TOTAL
Livestock	-0.7	-1.4	-3.6	-5.3	-7.9	-9.6	-28.5
Other Crops	-0.1	-0.2	-0.5	-0.8	-1.2	-1.4	-4.2
Livestock Feed	-13.4	-26.5	-68.6	-100.1	-150.7	-182.9	-542.3
Misc. Agriculture	-0.9	-1.9	-5.0	-7.5	-11.4	-15.2	-41.9
Non-petroleum Mines	-0.3	-0.4	-0.8	-1.1	-1.6	-2.0	-6.2
Petroleum & Gas Production	-0.2	-0.4	-0.9	-1.3	-1.9	-2.4	-7.1
New Construction	-0.8	-1.3	-3.0	-4.3	-6.4	-8.1	-23.8
Combined Manufacturing	-0.5	-1.0	-2.6	-3.9	-5.9	-7.9	-21.8
Food Products	0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-2.0
Wood Products	-0.1	-0.1	-0.3	-0.4	-0.6	-0.8	-2.3
Petroleum & Coal Products	-0.1	-0.1	-0.3	-0.5	-0.7	-1.0	-2.8
Transp, Comm, & Utilities	-0.6	-1.1	-2.4	-3.4	-5.2	-6.5	-19.1
Recreation Services	-0.4	-0.8	-2.0	-2.9	-4.3	-5.7	-16.1
Electric Power Production	-1.6	-1.9	-2.3	-2.5	-3.0	-3.4	-14.7
Wholesale/Retail Trade	-0.6	-1.2	-3.0	-4.4	-6.7	-8.7	-24.5
Finance, Insurance, Real Estate	-0.9	-1.8	-4.6	-6.9	-10.5	-13.6	-38.3
Household and Business Services	-1.1	-2.3	-5.6	-8.3	-12.8	-16.4	-46.5
Local Amusements	0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-1.0
Health, Education, Social Services	-0.1	-0.1	-0.3	-0.4	-0.6	-0.8	-2.4
Government Industries	-0.3	-0.5	-1.1	-1.6	-2.5	-3.4	-9.4
TOTAL	-22.7	-43.3	-107.4	-156.0	-234.8	-290.8	-855.0

Table II-11-NM-10. New Mexico: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	103.6	102.2	100.1	96.4	93.2	88.9	81.5
Other Crops	35.7	35.5	34.7	33.6	32.6	31.0	28.5
Livestock Feed	17.6	17.5	17.0	16.6	16.0	15.3	14.0
Misc. Agriculture	54.6	59.0	63.8	68.7	72.2	74.6	76.3
Non-petroleum Mines	379.5	375.3	375.5	371.1	364.8	355.7	334.7
Petroleum & Gas Production	649.4	623.2	612.9	595.5	579.0	559.9	538.2
New Construction	1066.9	1143.5	1221.0	1272.7	1303.4	1323.8	1312.7
Combined Manufacturing	1023.4	1077.5	1111.9	1130.7	1139.0	1141.7	1144.8
Food Products	108.4	110.6	111.8	112.7	113.1	113.5	114.1
Wood Products	161.3	176.4	185.9	192.0	195.2	195.1	191.7
Petroleum & Coal Products	183.5	181.8	182.4	181.9	181.6	180.8	179.7
Transp, Comm, & Utilities	880.0	949.4	1010.5	1042.8	1068.3	1087.0	1079.4
Recreation Services	720.4	797.4	870.0	935.4	979.8	1010.9	1033.0
Electric Power Production	295.4	323.1	345.2	357.8	365.0	368.2	364.1
Wholesale/Retail Trade	955.1	1047.9	1136.4	1196.8	1232.6	1257.1	1256.7
Finance, Insurance, Real Estate	409.2	446.8	479.4	502.2	517.5	525.3	525.4
Household and Business Services	1398.6	1526.8	1654.3	1744.2	1801.5	1857.2	1863.5
Local Amusements	69.2	75.6	81.2	85.2	87.6	89.2	91.2
Health, Education, Social Services	1154.6	1278.1	1397.0	1482.2	1531.1	1554.1	1558.7
Government Industries	2611.5	2776.0	2887.1	2953.5	2983.0	2997.9	3060.9
TOTAL	12278.0	13123.8	13878.2	14371.8	14656.3	14827.2	14849.1

Table II-11-NM-11. New Mexico: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	103.6	102.2	100.1	96.3	93.0	88.7	81.2
Other Crops	35.7	35.5	34.7	33.6	32.5	31.0	28.4
Livestock Feed	17.6	17.4	16.8	16.0	14.9	13.3	11.1
Misc. Agriculture	54.6	59.0	63.7	68.7	72.0	74.3	76.0
Non-petroleum Mines	379.5	375.3	375.5	371.0	364.7	355.5	334.4
Petroleum & Gas Production	649.4	623.2	612.9	595.4	578.8	559.6	537.7
New Construction	1066.9	1143.5	1221.0	1272.6	1303.1	1323.4	1312.1
Combined Manufacturing	1023.4	1077.5	1111.9	1130.6	1138.7	1141.3	1144.2
Food Products	108.4	110.6	111.8	112.7	113.1	113.5	114.1
Wood Products	161.3	176.4	185.9	192.0	195.2	195.0	191.6
Petroleum & Coal Products	183.5	181.8	182.4	181.8	181.5	180.6	179.3
Transp, Comm, & Utilities	880.0	949.4	1010.5	1042.6	1068.0	1086.5	1078.6
Recreation Services	720.4	797.4	870.0	935.4	979.7	1010.8	1032.8
Electric Power Production	295.4	323.0	345.0	357.5	364.6	367.8	363.5
Wholesale/Retail Trade	955.1	1047.9	1136.4	1196.7	1232.5	1256.9	1256.5
Finance, Insurance, Real Estate	409.2	446.8	479.4	502.1	517.2	524.8	524.7
Household and Business Services	1398.6	1526.8	1654.3	1744.0	1801.2	1856.6	1862.6
Local Amusements	69.2	75.6	81.2	85.2	87.5	89.2	91.2
Health, Education, Social Services	1154.6	1278.1	1397.0	1482.2	1531.1	1554.0	1558.7
Government Industries	2611.5	2776.0	2887.1	2953.4	2982.9	2997.8	3060.7
TOTAL	12278.0	13123.4	13877.3	14369.6	14652.3	14820.6	14839.1

Table II-11-NM-12. New Mexico: Earnings - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	-0.1	-0.4	-0.8	-1.3	-2.0
Misc. Agriculture	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3
Non-petroleum Mines	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Petroleum & Gas Production	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.4
New Construction	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Combined Manufacturing	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Transp. Comm. & Utilities	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Recreation Services	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Electric Power Production	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.4
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Finance, Insurance, Real Estate	0.0	0.0	0.0	-0.1	-0.2	-0.4	-0.6
Household and Business Services	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.8
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
TOTAL	0.0	-0.2	-0.6	-1.5	-2.8	-4.7	-7.1

Table II-11-NM-13. New Mexico: Earnings - Present Values of Differences by Sector
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-1.6	-0.8	-0.5	-0.2
Other Crops		-0.2	-0.1	-0.1	0.0
Livestock Feed		-19.4	-9.3	-5.9	-2.1
Misc. Agriculture		-2.6	-1.3	-0.8	-0.3
Non-petroleum Mines		-2.0	-1.0	-0.6	-0.2
Petroleum & Gas Production		-3.5	-1.7	-1.1	-0.4
New Construction		-5.0	-2.4	-1.5	-0.6
Combined Manufacturing		-4.4	-2.1	-1.3	-0.5
Food Products		-0.3	-0.2	-0.1	0.0
Wood Products		-0.4	-0.2	-0.1	0.0
Petroleum & Coal Products		-1.4	-0.7	-0.4	-0.2
Transp. Comm. & Utilities		-4.8	-2.3	-1.5	-0.5
Recreation Services		-1.5	-0.7	-0.5	-0.2
Electric Power Production		-5.3	-2.7	-1.8	-0.8
Wholesale/Retail Trade		-2.0	-1.0	-0.6	-0.2
Finance, Insurance, Real Estate		-6.1	-2.9	-1.9	-0.7
Household and Business Services		-7.7	-3.7	-2.3	-0.8
Local Amusements		-0.1	0.0	0.0	0.0
Health, Education, Social Services		-0.4	-0.2	-0.1	0.0
Government Industries		-1.8	-0.8	-0.5	-0.2
TOTAL		-70.5	-34.2	-21.8	-7.9

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Table II-11-NM-14. New Mexico: Indirect Business Tax - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	32.9	32.5	31.8	30.6	29.6	28.2	25.9
Other Crops	4.7	4.7	4.6	4.4	4.3	4.1	3.8
Livestock Feed	10.1	10.0	9.8	9.5	9.2	8.7	8.0
Misc. Agriculture	2.8	3.0	3.2	3.5	3.7	3.8	3.9
Non-petroleum Mines	64.6	63.9	63.9	63.2	62.1	60.6	57.0
Petroleum & Gas Production	1041.1	999.0	982.5	954.7	928.1	897.6	862.7
New Construction	27.0	29.0	30.9	32.2	33.0	33.5	33.2
Combined Manufacturing	42.0	44.3	45.7	46.4	46.8	46.9	47.0
Food Products	4.0	4.1	4.1	4.1	4.2	4.2	4.2
Wood Products	6.9	7.6	8.0	8.3	8.4	8.4	8.2
Petroleum & Coal Products	129.7	128.5	128.9	128.6	128.4	127.8	127.0
Transp, Comm, & Utilities	140.0	151.1	160.8	165.9	170.0	173.0	171.7
Recreation Services	113.8	126.0	137.4	147.8	154.8	159.7	163.2
Electric Power Production	111.0	121.3	129.6	134.4	137.1	138.3	136.7
Wholesale/Retail Trade	305.5	335.1	363.5	382.8	394.2	402.1	401.9
Finance, Insurance, Real Estate	411.6	449.5	482.3	505.2	520.6	528.4	528.6
Household and Business Services	32.0	35.0	37.9	40.0	41.3	42.6	42.7
Local Amusements	28.0	30.6	32.9	34.5	35.4	36.1	36.9
Health, Education, Social Services	5.2	5.8	6.3	6.7	6.9	7.0	7.1
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2513.0	2580.8	2664.2	2702.7	2718.0	2710.9	2669.8

Table II-11-NM-15. New Mexico: Indirect Business Tax - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	32.9	32.4	31.8	30.6	29.6	28.2	25.8
Other Crops	4.7	4.7	4.6	4.4	4.3	4.1	3.8
Livestock Feed	10.1	10.0	9.6	9.2	8.5	7.6	6.3
Misc. Agriculture	2.8	3.0	3.2	3.5	3.7	3.8	3.9
Non-petroleum Mines	64.6	63.9	63.9	63.2	62.1	60.5	57.0
Petroleum & Gas Production	1041.1	999.0	982.4	954.5	927.8	897.1	862.0
New Construction	27.0	29.0	30.9	32.2	33.0	33.5	33.2
Combined Manufacturing	42.0	44.3	45.7	46.4	46.8	46.9	47.0
Food Products	4.0	4.1	4.1	4.1	4.2	4.2	4.2
Wood Products	6.9	7.6	8.0	8.3	8.4	8.4	8.2
Petroleum & Coal Products	129.7	128.5	128.9	128.5	128.3	127.6	126.7
Transp, Comm, & Utilities	140.0	151.1	160.8	165.9	169.9	172.9	171.6
Recreation Services	113.8	126.0	137.4	147.8	154.8	159.7	163.2
Electric Power Production	111.0	121.3	129.6	134.3	136.9	138.1	136.5
Wholesale/Retail Trade	305.5	335.1	363.5	382.7	394.2	402.0	401.9
Finance, Insurance, Real Estate	411.6	449.4	482.2	505.1	520.3	527.9	527.8
Household and Business Services	32.0	35.0	37.9	40.0	41.3	42.5	42.7
Local Amusements	28.0	30.6	32.9	34.5	35.4	36.1	36.9
Health, Education, Social Services	5.2	5.8	6.3	6.7	6.9	7.0	7.1
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2513.0	2580.7	2663.8	2701.8	2716.3	2708.1	2665.6

Table II-11-NM-16. New Mexico: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	-0.1	-0.3	-0.6	-1.1	-1.7
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.7
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric Power Production	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Finance, Insurance, Real Estate	0.0	0.0	-0.1	-0.1	-0.3	-0.5	-0.8
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.1	-0.4	-0.9	-1.6	-2.8	-4.2

Table II-11-NM-17. New Mexico: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		-1.0	-0.5	-0.3	-0.1
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		-16.4	-7.9	-5.0	-1.8
Misc. Agriculture		-0.2	-0.1	-0.1	0.0
Non-petroleum Mines		-0.5	-0.2	-0.1	-0.1
Petroleum & Gas Production		-7.3	-3.6	-2.3	-0.8
New Construction		-0.2	-0.1	0.0	0.0
Combined Manufacturing		-0.2	-0.1	-0.1	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		-2.4	-1.1	-0.7	-0.3
Transp, Comm, & Utilities		-1.3	-0.6	-0.4	-0.1
Recreation Services		-0.3	-0.2	-0.1	0.0
Electric Power Production		-3.1	-1.6	-1.1	-0.4
Wholesale/Retail Trade		-0.8	-0.4	-0.2	-0.1
Finance, Insurance, Real Estate		-7.4	-3.6	-2.2	-0.8
Household and Business Services		-0.2	-0.1	-0.1	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-41.4	-20.1	-12.8	-4.6

Table II-11-NM-18. New Mexico: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	25.9	25.5	25.0	24.1	23.3	22.2	20.4
Other Crops	8.9	8.9	8.7	8.4	8.1	7.8	7.1
Livestock Feed	4.4	4.4	4.3	4.1	4.0	3.8	3.5
Misc. Agriculture	13.7	14.8	15.9	17.2	18.0	18.6	19.1
Non-petroleum Mines	94.9	93.8	93.9	92.8	91.2	88.9	83.7
Petroleum & Gas Production	162.4	155.8	153.2	148.9	144.7	140.0	134.5
New Construction	266.7	285.9	305.3	318.2	325.8	331.0	328.2
Combined Manufacturing	255.9	269.4	278.0	282.7	284.7	285.4	286.2
Food Products	27.1	27.7	28.0	28.2	28.3	28.4	28.5
Wood Products	40.3	44.1	46.5	48.0	48.8	48.8	47.9
Petroleum & Coal Products	45.9	45.5	45.6	45.5	45.4	45.2	44.9
Transp, Comm, & Utilities	220.0	237.3	252.6	260.7	267.1	271.8	269.9
Recreation Services	180.1	199.4	217.5	233.9	244.9	252.7	258.2
Electric Power Production	73.9	80.8	86.3	89.4	91.2	92.1	91.0
Wholesale/Retail Trade	238.8	262.0	284.1	299.2	308.1	314.3	314.2
Finance, Insurance, Real Estate	102.3	111.7	119.9	125.6	129.4	131.3	131.4
Household and Business Services	349.6	381.7	413.6	436.0	450.4	464.3	465.9
Local Amusements	17.3	18.9	20.3	21.3	21.9	22.3	22.8
Health, Education, Social Services	288.6	319.5	349.2	370.5	382.8	388.5	389.7
Government Industries	652.9	694.0	721.8	738.4	745.8	749.5	765.2
TOTAL	3069.5	3280.9	3469.6	3592.9	3664.1	3706.8	3712.3

Table II-11-NM-19. New Mexico: Personal Income Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	25.9	25.5	25.0	24.1	23.3	22.2	20.3
Other Crops	8.9	8.9	8.7	8.4	8.1	7.8	7.1
Livestock Feed	4.4	4.4	4.2	4.0	3.7	3.3	2.8
Misc. Agriculture	13.7	14.8	15.9	17.2	18.0	18.6	19.0
Non-petroleum Mines	94.9	93.8	93.9	92.7	91.2	88.9	83.6
Petroleum & Gas Production	162.4	155.8	153.2	148.9	144.7	139.9	134.4
New Construction	266.7	285.9	305.2	318.1	325.8	330.9	328.0
Combined Manufacturing	255.9	269.4	278.0	282.6	284.7	285.3	286.0
Food Products	27.1	27.7	28.0	28.2	28.3	28.4	28.5
Wood Products	40.3	44.1	46.5	48.0	48.8	48.8	47.9
Petroleum & Coal Products	45.9	45.5	45.6	45.5	45.4	45.1	44.8
Transp, Comm, & Utilities	220.0	237.3	252.6	260.6	267.0	271.6	269.6
Recreation Services	180.1	199.4	217.5	233.8	244.9	252.7	258.2
Electric Power Production	73.9	80.8	86.3	89.4	91.2	91.9	90.9
Wholesale/Retail Trade	238.8	262.0	284.1	299.2	308.1	314.2	314.1
Finance, Insurance, Real Estate	102.3	111.7	119.8	125.5	129.3	131.2	131.2
Household and Business Services	349.6	381.7	413.6	436.0	450.3	464.1	465.6
Local Amusements	17.3	18.9	20.3	21.3	21.9	22.3	22.8
Health, Education, Social Services	288.6	319.5	349.2	370.5	382.8	388.5	389.7
Government Industries	652.9	694.0	721.8	738.4	745.7	749.5	765.2
TOTAL	3069.5	3280.9	3469.3	3592.4	3663.1	3705.2	3709.8

Table II-11-NM-20. New Mexico: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.5
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
New Construction	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric Power Production	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Household and Business Services	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.1	-0.2	-0.4	-0.7	-1.2	-1.8

Table II-11-NM-21. New Mexico: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-0.4	-0.2	-0.1	0.0
Other Crops		-0.1	0.0	0.0	0.0
Livestock Feed		-4.8	-2.3	-1.5	-0.5
Misc. Agriculture		-0.7	-0.3	-0.2	-0.1
Non-petroleum Mines		-0.5	-0.2	-0.2	-0.1
Petroleum & Gas Production		-0.9	-0.4	-0.3	-0.1
New Construction		-1.2	-0.6	-0.4	-0.1
Combined Manufacturing		-1.1	-0.5	-0.3	-0.1
Food Products		-0.1	0.0	0.0	0.0
Wood Products		-0.1	0.0	0.0	0.0
Petroleum & Coal Products		-0.3	-0.2	-0.1	0.0
Transp, Comm, & Utilities		-1.2	-0.6	-0.4	-0.1
Recreation Services		-0.4	-0.2	-0.1	0.0
Electric Power Production		-1.3	-0.7	-0.5	-0.2
Wholesale/Retail Trade		-0.5	-0.2	-0.2	-0.1
Finance, Insurance, Real Estate		-1.5	-0.7	-0.5	-0.2
Household and Business Services		-1.9	-0.9	-0.6	-0.2
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-0.4	-0.2	-0.1	0.0
TOTAL		-17.6	-8.5	-5.4	-2.0

Table II-11-NM-22. New Mexico: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.0711	-0.0545	-0.0450	-0.0272
Earnings	-0.0197	-0.0152	-0.0126	-0.0078
Indirect Business Taxes	-0.0487	-0.0373	-0.0308	-0.0187
Personal Income Taxes	-0.0197	-0.0152	-0.0126	-0.0078

G. Utah State Impacts

1. Direct Impacts

The direct impacts for Utah associated with implementing the requirements of the endangered fishes were described in detail by river basin in Chapter II-9. It is useful to summarize these impacts here since the set of overall impacts forms the inputs to the State I-O model. Table II-11-UT-1 reports these impacts for the with fish scenario. Negative direct impacts on the Utah economy are projected to occur in the agriculture sector, the recreation sector, and the electric power sector. A positive direct effect occurs in coal (non-petroleum mining sector) due to the fuel substitution effects that occur in electric power production.

Table II-11-UT-1. Direct Impacts for Utah
(Listing and Critical Habitat)
(1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Livestock Feed	-0.0	-0.191	-0.421	-0.842	-0.881	-0.919
Recreation	-2.890	-2.890	-2.890	-2.890	-2.890	-2.890
Electric Power	-0.210	-0.140	-0.312	-0.564	-0.925	-1.184
Non-petroleum Mining	+0.932	+1.355	+1.404	+1.250	+1.260	+1.358
TOTAL	-2.168	-1.866	-2.219	-3.046	-3.436	-3.635

The major direct impacts for Utah occur in the recreation sector. The total negative impacts are sufficient to offset the positive effects in the coal sector and the net result is that the direct impacts are negative throughout the study period. The general trend of these direct effects is that they are growing over time. The total direct impacts represent 0.0071 percent of the aggregate industrial output by the year 2020.

2. Output (Direct and Indirect) Impacts

a. Aggregate Output

For Utah, there are both negative direct impacts and positive direct impacts. The positive impacts occur largely as a result of fuel substitution leading to expansion in the coal sector. Overall, the total impacts on aggregate output are negative. By 2020, output with fish is projected to be approximately $30 million lower that without fish. The cumulative losses amount to -$437 million (see Table II-11-UT-5). At a 3 percent discount rate these cumulative losses amount to $230 million and at 5 percent these losses are $156 million. The annual losses in 2020 amount to 0.06 percent of aggregate State output.

b. Sectoral Output

(1) Recreation Sector

The major direct impacts for Utah are projected to occur in the recreation sector. As a result, this sector also experiences the largest total effects (see Table II-11-UT-4). By 2020, output in this sector is projected to be approximately $20 million less than the baseline projected level. This represents approximately 67 percent of the total output effects for the State economy. The loss of $20 million of output in 2020 represents 0.68 percent of the projected output in the without fish scenario.

(2) Electric Power

The total impacts for the electric power sector are projected at -$3.5 million by 2020. This constitutes 0.35 percent of the projected baseline output. The cumulative impacts over the study period are -$36.7 million.

3. Employment

a. Aggregate Employment

Total employment is projected to fall as a result of the actions taken to preserve and recover the fishes. The changes are reported in Table II-11-UT-8 with five-year incremental effects reported in Table II-11-UT-9. Annual jobs foregone are projected to be 105 jobs in 1995 and this figure increases to 685 jobs in 2020. This projected impact means that 0.074

percent of the total jobs in the State economy are affected by the year 2020. The largest incremental impact occurs in the early part of the study period between 1995 and 2000 (see Table II-11-UT-9).

b. Sectoral Employment

(1) Recreation Sector

Employment is projected to fall in the recreation sector by 611.8 jobs in 2020 Table II-11-UT-8). This translates into 0.7 percent of the total jobs in this sector. The employment losses in the recreation services sector constitute 89 percent of the total job losses projected for the Utah economy as a result of actions taken on behalf of endangered species.

(2) Non-petroleum Mines

Employment is conversely projected to increase by 78 jobs by 2020 (Table II-11-UT-8). The largest increases are in later years.

4. Earnings

a. Aggregate Earnings

Total earnings are projected to experience a negative impact throughout the study period as a result of endangered species (Tables II-11-UT-10 through II-11-UT-13). By 2020 these losses amount to $7.7 million which is 0.038 percent of the projected total without fish earnings for that year (Table II-11-UT-12). The earnings impacts are relatively less than the employment impacts due to the fact that most of the foregone jobs will occur in lower earning sectors such as recreation services.

b. Sectoral Earnings

(1) Recreation

The negative impacts on employment in this sector result in negative impacts on total earnings. In Table II-11-UT-12 it is reported that the earnings in this sector are projected to be $1.3 million lower in the with fish scenario. These impacts increase until the difference is -$8.3 million in 2020.

(2) Non-petroleum Mines

This sector is projected to have positive impacts due to the fuel substitution that occurs as a result of reductions in the output of hydroelectric generation. In 1995 the positive impact in earnings is $0.5 million (Table II-11-UT-12).

5. Fiscal Impacts

The fall in earnings translates into a loss in personal income tax collections. By 2020 total income tax collections are projected to be $1.9 million lower when the impacts due to endangered species are taken into account. Indirect business taxes also fall when the endangered species impacts are introduced. The loss by 2020 is projected to be $1.7 million. Total fiscal impacts by 2020 sum to -$3.6 million. Over the entire study period, the losses in personal income taxes sum to $28.2 million (see Table II-11-UT-21) and the losses in indirect business taxes sum to $25.4 million (see Table II-11-UT-17).

6. Summary

The overall losses in the Utah economy are heavily concentrated in the recreation services sector. There are some additional losses in the livestock feed sector. Offsetting increases occur in the non-petroleum mines sector.

Table II-11-UT-22 reports the deviations from the without fish scenario. The present value of the with fish stream of output over the study period is -0.0233 percent lower than in the without fish scenario (at a 3 percent discount rate).

Table II-11-UT-2. Utah: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	623.6	614.9	602.5	580.0	560.7	540.8	512.2
Other Crops	83.3	82.7	80.9	78.3	75.9	73.1	69.2
Livestock Feed	307.9	306.6	298.6	290.0	280.4	270.2	255.8
Misc. Agriculture	53.8	58.2	62.9	67.8	71.2	73.5	75.3
Non-petroleum Mines	1180.5	1167.4	1167.9	1154.1	1134.6	1106.3	1063.1
Petroleum & Gas Production	1383.4	1327.4	1305.5	1268.5	1233.2	1192.7	1146.4
New Construction	2675.1	2867.1	3061.5	3191.0	3267.9	3319.2	3347.1
Combined Manufacturing	9567.1	10073.2	10394.6	10570.2	10647.4	10671.9	10354.9
Food Products	1359.1	1386.5	1401.7	1412.2	1417.5	1423.6	1431.3
Wood Products	760.9	832.1	876.9	905.7	920.9	920.3	904.3
Petroleum & Coal Products	2962.1	2934.3	2943.7	2906.3	2859.8	2728.5	2559.6
Transp, Comm, & Utilities	4587.5	4949.5	5268.2	5436.3	5569.4	5666.9	5706.6
Recreation Services	2032.4	2249.9	2454.6	2639.2	2764.3	2852.2	2914.4
Electric Power Production	818.3	894.9	956.0	990.9	1011.0	1020.0	1008.4
Wholesale/Retail Trade	2092.8	2296.0	2490.0	2622.2	2700.7	2754.4	2762.7
Finance, Insurance, Real Estate	4290.7	4685.4	5027.5	5266.8	5426.9	5508.3	5579.9
Household and Business Services	3311.1	3614.7	3916.5	4129.2	4265.0	4396.8	4530.5
Local Amusements	308.9	337.6	362.6	380.3	391.0	398.4	407.2
Health, Education, Social Services	2783.1	3080.9	3367.4	3572.8	3690.7	3746.1	3794.8
Government Industries	2552.0	2712.8	2821.3	2886.2	2915.0	2958.8	3020.9
TOTAL	43733.5	46472.1	48860.8	50348.0	51203.5	51622.0	51444.6

Table II-11-UT-3. Utah: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	623.6	614.8	602.4	579.8	560.4	540.5	511.7
Other Crops	83.3	82.6	80.9	78.3	75.9	73.1	69.2
Livestock Feed	307.9	305.6	296.8	287.3	276.8	265.8	250.8
Misc. Agriculture	53.8	58.2	62.9	67.7	71.1	73.5	75.2
Non-petroleum Mines	1180.5	1168.4	1170.3	1158.0	1139.7	1112.5	1070.5
Petroleum & Gas Production	1383.4	1327.3	1305.4	1268.3	1232.9	1192.2	1145.8
New Construction	2675.1	2867.1	3061.4	3190.9	3267.7	3318.9	3346.7
Combined Manufacturing	9567.1	10073.1	10394.4	10569.9	10647.0	10671.4	10354.3
Food Products	1359.1	1386.4	1401.3	1411.6	1416.8	1422.7	1430.2
Wood Products	760.9	832.1	876.8	905.5	920.7	920.1	904.0
Petroleum & Coal Products	2962.1	2934.0	2943.2	2905.6	2858.8	2727.2	2558.0
Transp, Comm, & Utilities	4587.5	4949.3	5267.9	5435.8	5568.9	5666.1	5705.6
Recreation Services	2032.4	2246.9	2448.4	2629.5	2751.2	2835.7	2894.5
Electric Power Production	818.3	894.7	955.6	990.2	1009.6	1017.6	1004.9
Wholesale/Retail Trade	2092.8	2296.0	2490.0	2622.2	2700.6	2754.3	2762.6
Finance, Insurance, Real Estate	4290.7	4685.2	5027.0	5266.1	5426.0	5507.2	5578.5
Household and Business Services	3311.1	3614.6	3916.2	4128.8	4264.5	4396.1	4529.6
Local Amusements	308.9	337.6	362.5	380.3	390.9	398.3	407.1
Health, Education, Social Services	2783.1	3080.9	3367.4	3572.8	3690.7	3746.1	3794.8
Government Industries	2552.0	2712.7	2821.2	2886.1	2915.0	2958.7	3020.8
TOTAL	43733.5	46467.6	48852.0	50334.7	51185.1	51597.9	51414.8

Table II-11-UT-4. Utah: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	-0.1	-0.2	-0.2	-0.3	-0.4	-0.4
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	-0.9	-1.9	-2.7	-3.6	-4.4	-5.1
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	1.0	2.4	3.9	5.1	6.2	7.3
Petroleum & Gas Production	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6
New Construction	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4
Combined Manufacturing	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6
Food Products	0.0	-0.2	-0.4	-0.5	-0.7	-0.9	-1.1
Wood Products	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3
Petroleum & Coal Products	0.0	-0.2	-0.5	-0.7	-1.0	-1.3	-1.6
Transp, Comm, & Utilities	0.0	-0.1	-0.3	-0.4	-0.6	-0.8	-1.0
Recreation Services	0.0	-3.0	-6.2	-9.7	-13.1	-16.5	-19.8
Electric Power Production	0.0	-0.2	-0.4	-0.8	-1.4	-2.4	-3.5
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Finance, Insurance, Real Estate	0.0	-0.2	-0.4	-0.6	-0.9	-1.1	-1.3
Household and Business Services	0.0	-0.1	-0.3	-0.4	-0.6	-0.7	-0.9
Local Amusements	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
TOTAL	0.0	-4.5	-8.7	-13.3	-18.5	-24.1	-29.8

Table II-11-UT-5. Utah: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Discount Rates	Direct and Indirect Impacts 0.00	0.03	0.05	0.10
Livestock		-7.0	-3.8	-2.6	-1.1
Other Crops		-0.6	-0.3	-0.2	-0.1
Livestock Feed		-83.2	-44.5	-30.4	-13.3
Misc. Agriculture		-0.7	-0.3	-0.2	-0.1
Non-petroleum Mines		115.2	60.8	41.1	17.5
Petroleum & Gas Production		-8.5	-4.5	-3.0	-1.3
New Construction		-5.9	-3.1	-2.1	-0.9
Combined Manufacturing		-9.4	-5.0	-3.4	-1.5
Food Products		-17.0	-9.0	-6.1	-2.7
Wood Products		-4.3	-2.3	-1.5	-0.7
Petroleum & Coal Products		-23.4	-12.3	-8.4	-3.6
Transp, Comm, & Utilities		-14.1	-7.3	-4.9	-2.1
Recreation Services		-303.3	-160.1	-108.5	-46.5
Electric Power Production		-36.7	-18.2	-11.8	-4.6
Wholesale/Retail Trade		-1.3	-0.7	-0.4	-0.2
Finance, Insurance, Real Estate		-20.6	-10.9	-7.4	-3.2
Household and Business Services		-13.4	-7.1	-4.8	-2.1
Local Amusements		-1.6	-0.8	-0.6	-0.2
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-1.6	-0.8	-0.6	-0.2
TOTAL		-437.3	-230.3	-155.9	-66.9

Table II-11-UT-6. Utah: Employment - Without Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

INDUSTRIAL SECTORS	Direct and Indirect Imapcts						
	1989	1995	2000	2005	2010	2015	2020
Livestock	7794.9	7498.7	7326.2	7115.2	6891.8	6647.1	6294.8
Other Crops	2385.9	2295.3	2242.5	2177.9	2109.5	2034.6	1926.8
Livestock Feed	2895.4	2785.4	2721.3	2643.0	2560.0	2469.1	2338.2
Misc. Agriculture	2573.0	2778.8	3001.1	3234.9	3394.1	3506.1	3589.5
Non-petroleum Mines	12606.7	12355.9	12348.4	12202.7	12008.7	11708.5	11251.9
Petroleum & Gas Production	1823.0	1733.7	1705.1	1660.1	1617.1	1563.9	1503.2
New Construction	29193.2	31289.2	33410.6	34823.9	35663.2	36223.1	36527.3
Combined Manufacturing	113436.5	119437.3	123247.4	125330.2	126245.1	126535.5	122777.4
Food Products	11629.6	11864.5	11993.8	12083.7	12129.7	12181.8	12247.6
Wood Products	14242.8	15575.9	16413.9	16952.3	17237.1	17226.8	16927.0
Petroleum & Coal Products	2307.2	2285.6	2292.9	2263.7	2227.5	2125.3	1993.7
Transp, Comm, & Utilities	40774.7	43991.9	46824.9	48318.6	49502.4	50368.7	50721.3
Recreation Services	62681.0	69387.9	75702.2	81395.0	85253.1	87964.2	89881.8
Electric Power Production	3862.6	4224.1	4512.6	4677.3	4771.8	4814.3	4759.9
Wholesale/Retail Trade	115769.4	127010.6	137743.0	145057.2	149394.4	152367.3	152824.4
Finance, Insurance, Real Estate	32016.0	34961.5	37513.7	39299.3	40494.0	41101.4	41635.7
Household and Business Services	65643.9	71663.5	77647.4	81863.6	84557.0	87169.8	89819.7
Local Amusements	9796.6	10707.6	11500.0	12063.5	12401.3	12636.9	12914.9
Health, Education, Social Services	80781.5	89425.1	97741.7	103703.9	107126.1	108733.0	110146.6
Government Industries	133342.1	141742.6	147412.3	150802.8	152310.8	154595.5	157842.0
TOTAL	745556.0	803015.0	853301.0	887669.0	907894.7	921972.9	927923.9

Table II-11-UT-7. Utah: Employment - With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

INDUSTRIAL SECTORS	Direct and Indirect Impacts						
	1989	1995	2000	2005	2010	2015	2020
Livestock	7794.9	7497.7	7324.3	7112.4	6888.1	6642.6	6289.5
Other Crops	2385.9	2295.1	2242.1	2177.4	2108.8	2033.8	1925.8
Livestock Feed	2895.4	2776.9	2704.5	2618.0	2527.3	2429.0	2291.7
Misc. Agriculture	2573.0	2778.5	3000.5	3233.9	3392.7	3504.4	3587.5
Non-petroleum Mines	12606.7	12366.2	12373.9	12243.5	12062.5	11774.4	11329.5
Petroleum & Gas Production	1823.0	1733.6	1704.8	1659.7	1616.6	1563.2	1502.4
New Construction	29193.2	31288.6	33409.4	34822.0	35660.5	36219.4	36522.6
Combined Manufacturing	113436.5	119436.0	123245.0	125326.8	126240.5	126529.5	122770.2
Food Products	11629.6	11862.9	11990.7	12079.1	12123.4	12174.0	12238.2
Wood Products	14242.8	15575.1	16412.2	16949.7	17233.7	17222.5	16921.9
Petroleum & Coal Products	2307.2	2285.4	2292.5	2263.2	2226.8	2124.3	1992.5
Transp, Comm, & Utilities	40774.7	43990.6	46822.6	48315.0	49497.3	50361.7	50712.3
Recreation Services	62681.0	69296.0	75510.3	81097.0	84849.2	87455.4	89270.0
Electric Power Production	3862.6	4222.9	4510.6	4673.6	4765.3	4803.2	4743.2
Wholesale/Retail Trade	115769.4	127009.9	137741.6	145055.0	149391.4	152363.5	152819.9
Finance, Insurance, Real Estate	32016.0	34959.9	37510.5	39294.5	40487.4	41093.1	41625.7
Household and Business Services	65643.9	71660.7	77641.9	81855.4	84545.7	87155.4	89802.0
Local Amusements	9796.6	10707.1	11499.0	12061.9	12399.2	12634.2	12911.7
Health, Education, Social Services	80781.5	89425.1	97741.6	103703.9	107126.1	108732.9	110146.4
Government Industries	133342.1	141741.8	147410.6	150800.3	152307.4	154591.0	157836.4
TOTAL	745556.0	802910.1	853088.7	887342.3	907449.6	921407.4	927239.3

Table II-11-UT-8. Utah: Employment - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	-1.0	-1.9	-2.8	-3.7	-4.6	-5.3
Other Crops	0.0	-0.2	-0.4	-0.5	-0.7	-0.8	-1.0
Livestock Feed	0.0	-8.5	-16.9	-24.9	-32.7	-40.1	-46.5
Misc. Agriculture	0.0	-0.3	-0.6	-1.0	-1.4	-1.7	-2.1
Non-petroleum Mines	0.0	10.3	25.5	40.7	53.7	65.9	77.7
Petroleum & Gas Production	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.8
New Construction	0.0	-0.6	-1.2	-1.9	-2.7	-3.7	-4.8
Combined Manufacturing	0.0	-1.3	-2.3	-3.5	-4.7	-6.0	-7.2
Food Products	0.0	-1.5	-3.1	-4.7	-6.2	-7.8	-9.4
Wood Products	0.0	-0.8	-1.7	-2.6	-3.4	-4.3	-5.1
Petroleum & Coal Products	0.0	-0.2	-0.4	-0.6	-0.8	-1.0	-1.2
Transp, Comm, & Utilities	0.0	-1.2	-2.4	-3.6	-5.2	-7.0	-9.0
Recreation Services	0.0	-91.9	-191.9	-298.0	-403.9	-508.7	-611.8
Electric Power Production	0.0	-1.2	-2.0	-3.7	-6.6	-11.1	-16.7
Wholesale/Retail Trade	0.0	-0.7	-1.4	-2.2	-3.0	-3.8	-4.6
Finance, Insurance, Real Estate	0.0	-1.6	-3.2	-4.8	-6.6	-8.3	-10.1
Household and Business Services	0.0	-2.8	-5.5	-8.3	-11.2	-14.4	-17.7
Local Amusements	0.0	-0.5	-1.0	-1.6	-2.1	-2.7	-3.3
Health, Education, Social Services	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Government Industries	0.0	-0.9	-1.7	-2.5	-3.5	-4.5	-5.6
TOTAL	0.0	-105.0	-212.3	-326.7	-445.1	-565.4	-684.6

Table II-11-UT-9. Utah: Jobs Available
(Listing and Critical Habitat)
(Number of Jobs)

	CHANGE OF NUMBER OF JOBS AVAILABLE FOR FIVE INCREMENTAL YEARS					
INDUSTRIAL SECTORS	**1989-1995**	**1995-2000**	**2000-2005**	**2005-2010**	**2010-2015**	**2015-2020**
Livestock	-1.0	-0.9	-0.9	-0.9	-0.8	-0.7
Other Crops	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1
Livestock Feed	-8.5	-8.3	-8.1	-7.8	-7.4	-6.4
Misc. Agriculture	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4
Non-petroleum Mines	10.3	15.2	15.3	13.0	12.1	11.8
Petroleum & Gas Production	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
New Construction	-0.6	-0.6	-0.7	-0.8	-1.0	-1.1
Combined Manufacturing	-1.3	-1.1	-1.1	-1.2	-1.3	-1.2
Food Products	-1.5	-1.6	-1.6	-1.6	-1.6	-1.6
Wood Products	-0.8	-0.9	-0.9	-0.9	-0.9	-0.8
Petroleum & Coal Products	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Transp, Comm, & Utilities	-1.2	-1.1	-1.3	-1.5	-1.8	-2.0
Recreation Services	-91.9	-100.0	-106.1	-106.0	-104.8	-103.1
Electric Power Production	-1.2	-0.9	-1.7	-2.9	-4.6	-5.6
Wholesale/Retail Trade	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8
Finance, Insurance, Real Estate	-1.6	-1.6	-1.6	-1.7	-1.7	-1.8
Household and Business Services	-2.8	-2.7	-2.8	-3.0	-3.2	-3.3
Local Amusements	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	-0.9	-0.8	-0.9	-0.9	-1.0	-1.1
TOTAL	0.0	-210.6	-113.5	-117.5	-119.3	-118.1

[*] Change between 1989 and 1995 is six years

Table II-11-UT-10. Utah: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	69.9	68.9	67.6	65.0	62.9	60.6	57.4
Other Crops	13.1	13.0	12.7	12.3	12.0	11.5	10.9
Livestock Feed	16.6	16.5	16.1	15.7	15.1	14.6	13.8
Misc. Agriculture	27.3	29.5	31.9	34.4	36.1	37.3	38.2
Non-petroleum Mines	598.9	592.3	592.5	585.5	575.7	561.3	539.4
Petroleum & Gas Production	124.2	119.2	117.2	113.9	110.7	107.1	102.9
New Construction	1076.1	1153.3	1231.5	1283.6	1314.6	1335.2	1346.4
Combined Manufacturing	3802.8	4004.0	4131.7	4201.5	4232.2	4241.9	4115.9
Food Products	299.4	305.5	308.8	311.1	312.3	313.6	315.3
Wood Products	276.5	302.4	318.7	329.1	334.6	334.4	328.6
Petroleum & Coal Products	230.7	228.5	229.2	226.3	222.7	212.5	199.3
Transp, Comm, & Utilities	1380.1	1489.0	1584.8	1635.4	1675.5	1704.8	1716.7
Recreation Services	855.2	946.7	1032.8	1110.5	1163.1	1200.1	1226.3
Electric Power Production	168.7	184.5	197.1	204.3	208.4	210.2	207.9
Wholesale/Retail Trade	1171.8	1285.6	1394.2	1468.3	1512.2	1542.3	1546.9
Finance, Insurance, Real Estate	632.1	690.2	740.6	775.9	799.5	811.5	822.0
Household and Business Services	1495.9	1633.0	1769.4	1865.5	1926.9	1986.4	2046.8
Local Amusements	144.1	157.5	169.2	177.5	182.5	185.9	190.0
Health, Education, Social Services	1884.1	2085.6	2279.6	2418.7	2498.5	2536.0	2568.9
Government Industries	2451.4	2605.9	2710.1	2772.4	2800.2	2842.2	2901.8
TOTAL	16718.9	17911.2	18935.9	19606.9	19995.4	20249.4	20295.6

Table II-11-UT-11. Utah: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	69.9	68.9	67.5	65.0	62.8	60.6	57.4
Other Crops	13.1	13.0	12.7	12.3	11.9	11.5	10.9
Livestock Feed	16.6	16.5	16.0	15.5	14.9	14.3	13.5
Misc. Agriculture	27.3	29.5	31.9	34.4	36.1	37.3	38.1
Non-petroleum Mines	598.9	592.8	593.7	587.5	578.2	564.4	543.1
Petroleum & Gas Production	124.2	119.2	117.2	113.9	110.7	107.1	102.9
New Construction	1076.1	1153.3	1231.5	1283.6	1314.5	1335.1	1346.3
Combined Manufacturing	3802.8	4003.9	4131.6	4201.4	4232.0	4241.7	4115.7
Food Products	299.4	305.4	308.7	311.0	312.1	313.4	315.1
Wood Products	276.5	302.4	318.6	329.1	334.6	334.4	328.5
Petroleum & Coal Products	230.7	228.5	229.2	226.3	222.6	212.4	199.2
Transp, Comm, & Utilities	1380.1	1488.9	1584.8	1635.3	1675.3	1704.6	1716.4
Recreation Services	855.2	945.4	1030.2	1106.4	1157.6	1193.2	1217.9
Electric Power Production	168.7	184.4	197.0	204.1	208.1	209.7	207.1
Wholesale/Retail Trade	1171.8	1285.6	1394.2	1468.3	1512.2	1542.2	1546.9
Finance, Insurance, Real Estate	632.1	690.2	740.6	775.8	799.3	811.3	821.8
Household and Business Services	1495.9	1633.0	1769.3	1865.3	1926.6	1986.1	2046.4
Local Amusements	144.1	157.5	169.2	177.5	182.4	185.9	190.0
Health, Education, Social Services	1884.1	2085.6	2279.6	2418.7	2498.5	2536.0	2568.9
Government Industries	2451.4	2605.9	2710.1	2772.4	2800.1	2842.1	2901.7
TOTAL	16718.9	17910.0	18933.7	19603.5	19990.7	20243.2	20287.9

Table II-11-UT-12. Utah: Earnings - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.5	1.2	2.0	2.6	3.2	3.7
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
New Construction	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Combined Manufacturing	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.2
Food Products	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.2
Wood Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Petroleum & Coal Products	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Transp, Comm, & Utilities	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3
Recreation Services	0.0	-1.3	-2.6	-4.1	-5.5	-6.9	-8.3
Electric Power Production	0.0	-0.1	-0.1	-0.2	-0.3	-0.5	-0.7
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2
Household and Business Services	0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
TOTAL	0.0	-1.2	-2.2	-3.4	-4.7	-6.2	-7.7

Table II-11-UT-13. Utah: Earnings - Present Values of Differences by Sector
(Listing and Critical Habitat)
(1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		-0.8	-0.4	-0.3	-0.1
Other Crops		-0.1	0.0	0.0	0.0
Livestock Feed		-4.5	-2.4	-1.6	-0.7
Misc. Agriculture		-0.3	-0.2	-0.1	-0.1
Non-petroleum Mines		58.4	30.8	20.9	8.9
Petroleum & Gas Production		-0.8	-0.4	-0.3	-0.1
New Construction		-2.4	-1.2	-0.8	-0.4
Combined Manufacturing		-3.7	-2.0	-1.3	-0.6
Food Products		-3.7	-2.0	-1.4	-0.6
Wood Products		-1.6	-0.8	-0.6	-0.2
Petroleum & Coal Products		-1.8	-1.0	-0.7	-0.3
Transp, Comm, & Utilities		-4.2	-2.2	-1.5	-0.6
Recreation Services		-127.6	-67.4	-45.7	-19.6
Electric Power Production		-7.6	-3.8	-2.4	-0.9
Wholesale/Retail Trade		-0.7	-0.4	-0.3	-0.1
Finance, Insurance, Real Estate		-3.0	-1.6	-1.1	-0.5
Household and Business Services		-6.0	-3.2	-2.2	-0.9
Local Amusements		-0.7	-0.4	-0.3	-0.1
Health, Education, Social Services		-0.1	0.0	0.0	0.0
Government Industries		-1.5	-0.8	-0.5	-0.2
TOTAL		-112.7	-59.3	-40.2	-17.2

Table II-11-UT-14. Utah: Indirect Business Tax - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	17.6	17.4	17.0	16.4	15.8	15.3	14.5
Other Crops	1.9	1.9	1.9	1.8	1.7	1.7	1.6
Livestock Feed	9.5	9.5	9.2	9.0	8.7	8.4	7.9
Misc. Agriculture	1.4	1.5	1.6	1.8	1.9	1.9	2.0
Non-petroleum Mines	88.3	87.3	87.4	86.3	84.9	82.8	79.5
Petroleum & Gas Production	199.1	191.1	187.9	182.6	177.5	171.7	165.0
New Construction	31.4	33.6	35.9	37.4	38.3	38.9	39.2
Combined Manufacturing	160.2	168.6	174.0	177.0	178.2	178.7	173.4
Food Products	11.6	11.8	11.9	12.0	12.1	12.1	12.2
Wood Products	10.1	11.0	11.6	12.0	12.2	12.2	12.0
Petroleum & Coal Products	161.5	160.0	160.5	158.5	156.0	148.8	139.6
Transp, Comm, & Utilities	208.1	224.5	239.0	246.6	252.7	257.1	258.9
Recreation Services	144.8	160.3	174.9	188.0	196.9	203.2	207.6
Electric Power Production	51.0	55.8	59.6	61.8	63.1	63.6	62.9
Wholesale/Retail Trade	372.6	408.8	443.3	466.9	480.8	490.4	491.9
Finance, Insurance, Real Estate	673.5	735.5	789.2	826.7	851.8	864.6	875.9
Household and Business Services	48.8	53.2	57.7	60.8	62.8	64.8	66.7
Local Amusements	15.3	16.7	18.0	18.8	19.4	19.7	20.2
Health, Education, Social Services	6.8	7.6	8.3	8.8	9.1	9.2	9.3
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2213.6	2356.2	2488.9	2573.2	2623.9	2645.0	2640.2

Table II-11-UT-15. Utah: Indirect Business Tax - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	17.6	17.4	17.0	16.4	15.8	15.3	14.5
Other Crops	1.9	1.9	1.9	1.8	1.7	1.7	1.6
Livestock Feed	9.5	9.5	9.2	8.9	8.6	8.2	7.8
Misc. Agriculture	1.4	1.5	1.6	1.8	1.9	1.9	2.0
Non-petroleum Mines	88.3	87.4	87.6	86.6	85.3	83.2	80.1
Petroleum & Gas Production	199.1	191.1	187.9	182.6	177.5	171.6	164.9
New Construction	31.4	33.6	35.9	37.4	38.3	38.9	39.2
Combined Manufacturing	160.2	168.6	174.0	177.0	178.2	178.6	173.3
Food Products	11.6	11.8	11.9	12.0	12.0	12.1	12.2
Wood Products	10.1	11.0	11.6	12.0	12.2	12.2	12.0
Petroleum & Coal Products	161.5	160.0	160.5	158.5	155.9	148.7	139.5
Transp, Comm, & Utilities	208.1	224.5	239.0	246.6	252.6	257.0	258.8
Recreation Services	144.8	160.1	174.4	187.3	196.0	202.0	206.2
Electric Power Production	51.0	55.8	59.6	61.8	63.0	63.5	62.7
Wholesale/Retail Trade	372.6	408.8	443.3	466.8	480.8	490.4	491.8
Finance, Insurance, Real Estate	673.5	735.4	789.1	826.6	851.7	864.5	875.7
Household and Business Services	48.8	53.2	57.7	60.8	62.8	64.8	66.7
Local Amusements	15.3	16.7	18.0	18.8	19.4	19.7	20.2
Health, Education, Social Services	6.8	7.6	8.3	8.8	9.1	9.2	9.3
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2213.6	2355.9	2488.4	2572.4	2622.8	2643.6	2638.4

Table II-11-UT-16. Utah: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.1	0.2	0.3	0.4	0.5	0.5
Petroleum & Gas Production	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Transp. Comm. & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	-0.2	-0.4	-0.7	-0.9	-1.2	-1.4
Electric Power Production	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.3	-0.5	-0.8	-1.1	-1.4	-1.7

Table II-11-UT-17. Utah: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		-0.2	-0.1	-0.1	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		-2.6	-1.4	-0.9	-0.4
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		8.6	4.5	3.1	1.3
Petroleum & Gas Production		-1.2	-0.6	-0.4	-0.2
New Construction		-0.1	0.0	0.0	0.0
Combined Manufacturing		-0.2	-0.1	-0.1	0.0
Food Products		-0.1	-0.1	-0.1	0.0
Wood Products		-0.1	0.0	0.0	0.0
Petroleum & Coal Products		-1.3	-0.7	-0.5	-0.2
Transp. Comm. & Utilities		-0.6	-0.3	-0.2	-0.1
Recreation Services		-21.6	-11.4	-7.7	-3.3
Electric Power Production		-2.3	-1.1	-0.7	-0.3
Wholesale/Retail Trade		-0.2	-0.1	-0.1	0.0
Finance, Insurance, Real Estate		-3.2	-1.7	-1.2	-0.5
Household and Business Services		-0.2	-0.1	-0.1	0.0
Local Amusements		-0.1	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-25.4	-13.3	-9.0	-3.9

Table II-11-UT-18. Utah: Personal Income Tax - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	17.5	17.2	16.9	16.3	15.7	15.2	14.4
Other Crops	3.3	3.3	3.2	3.1	3.0	2.9	2.7
Livestock Feed	4.2	4.1	4.0	3.9	3.8	3.6	3.5
Misc. Agriculture	6.8	7.4	8.0	8.6	9.0	9.3	9.5
Non-petroleum Mines	149.7	148.1	148.1	146.4	143.9	140.3	134.8
Petroleum & Gas Production	31.1	29.8	29.3	28.5	27.7	26.8	25.7
New Construction	269.0	288.3	307.9	320.9	328.6	333.8	336.6
Combined Manufacturing	950.7	1001.0	1032.9	1050.4	1058.0	1060.5	1029.0
Food Products	74.9	76.4	77.2	77.8	78.1	78.4	78.8
Wood Products	69.1	75.6	79.7	82.3	83.7	83.6	82.2
Petroleum & Coal Products	57.7	57.1	57.3	56.6	55.7	53.1	49.8
Transp, Comm, & Utilities	345.0	372.2	396.2	408.8	418.9	426.2	429.2
Recreation Services	213.8	236.7	258.2	277.6	290.8	300.0	306.6
Electric Power Production	42.2	46.1	49.3	51.1	52.1	52.6	52.0
Wholesale/Retail Trade	293.0	321.4	348.6	367.1	378.0	385.6	386.7
Finance, Insurance, Real Estate	158.0	172.6	185.2	194.0	199.9	202.9	205.5
Household and Business Services	374.0	408.3	442.4	466.4	481.7	496.6	511.7
Local Amusements	36.0	39.4	42.3	44.4	45.6	46.5	47.5
Health, Education, Social Services	471.0	521.4	569.9	604.7	624.6	634.0	642.2
Government Industries	612.9	651.5	677.5	693.1	700.0	710.5	725.5
TOTAL	4179.7	4477.8	4734.0	4901.7	4998.9	5062.3	5073.9

Table II-11-UT-19. Utah: Personal Income Tax - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	17.5	17.2	16.9	16.3	15.7	15.1	14.3
Other Crops	3.3	3.3	3.2	3.1	3.0	2.9	2.7
Livestock Feed	4.2	4.1	4.0	3.9	3.7	3.6	3.4
Misc. Agriculture	6.8	7.4	8.0	8.6	9.0	9.3	9.5
Non-petroleum Mines	149.7	148.2	148.4	146.9	144.6	141.1	135.8
Petroleum & Gas Production	31.1	29.8	29.3	28.5	27.7	26.8	25.7
New Construction	269.0	288.3	307.9	320.9	328.6	333.8	336.6
Combined Manufacturing	950.7	1001.0	1032.9	1050.3	1058.0	1060.4	1028.9
Food Products	74.9	76.4	77.2	77.7	78.0	78.4	78.8
Wood Products	69.1	75.6	79.7	82.3	83.6	83.6	82.1
Petroleum & Coal Products	57.7	57.1	57.3	56.6	55.7	53.1	49.8
Transp, Comm, & Utilities	345.0	372.2	396.2	408.8	418.8	426.1	429.1
Recreation Services	213.8	236.4	257.5	276.6	289.4	298.3	304.5
Electric Power Production	42.2	46.1	49.2	51.0	52.0	52.4	51.8
Wholesale/Retail Trade	293.0	321.4	348.6	367.1	378.0	385.6	386.7
Finance, Insurance, Real Estate	158.0	172.6	185.1	193.9	199.8	202.8	205.5
Household and Business Services	374.0	408.2	442.3	466.3	481.7	496.5	511.6
Local Amusements	36.0	39.4	42.3	44.4	45.6	46.5	47.5
Health, Education, Social Services	471.0	521.4	569.9	604.7	624.6	634.0	642.2
Government Industries	612.9	651.5	677.5	693.1	700.0	710.5	725.4
TOTAL	4179.7	4477.5	4733.4	4900.9	4997.7	5060.8	5072.0

Table II-11-UT-20. Utah: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.1	0.3	0.5	0.6	0.8	0.9
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Food Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Recreation Services	0.0	-0.3	-0.7	-1.0	-1.4	-1.7	-2.1
Electric Power Production	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	-0.3	-0.6	-0.8	-1.2	-1.6	-1.9

Table II-11-UT-21. Utah: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**Discount Rates**	**0.00**	**0.03**	**0.05**	**0.10**
Livestock		-0.2	-0.1	-0.1	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		-1.1	-0.6	-0.4	-0.2
Misc. Agriculture		-0.1	0.0	0.0	0.0
Non-petroleum Mines		14.6	7.7	5.2	2.2
Petroleum & Gas Production		-0.2	-0.1	-0.1	0.0
New Construction		-0.6	-0.3	-0.2	-0.1
Combined Manufacturing		-0.9	-0.5	-0.3	-0.1
Food Products		-0.9	-0.5	-0.3	-0.1
Wood Products		-0.4	-0.2	-0.1	-0.1
Petroleum & Coal Products		-0.5	-0.2	-0.2	-0.1
Transp, Comm, & Utilities		-1.1	-0.6	-0.4	-0.2
Recreation Services		-31.9	-16.8	-11.4	-4.9
Electric Power Production		-1.9	-0.9	-0.6	-0.2
Wholesale/Retail Trade		-0.2	-0.1	-0.1	0.0
Finance, Insurance, Real Estate		-0.8	-0.4	-0.3	-0.1
Household and Business Services		-1.5	-0.8	-0.5	-0.2
Local Amusements		-0.2	-0.1	-0.1	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.4	-0.2	-0.1	-0.1
TOTAL		-28.2	-14.8	-10.0	-4.3

Table II-11-UT-22. Utah: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.0278	-0.0233	-0.0205	-0.0149
Earnings	-0.0184	-0.0155	-0.0136	-0.0099
Indirect Business Taxes	-0.0316	-0.0265	-0.0233	-0.0169
Personal Income Taxes	-0.0184	-0.0155	-0.0136	-0.0099

H. Wyoming State Impacts

1. Direct Impacts

The direct impacts for the Wyoming economy from actions taken on behalf of the endangered fishes were described in Chapter II-9. Table II-11-WY-1 reports the with fish direct impacts scenario. The negative direct impacts for Wyoming are projected to occur in the livestock feed sector and the recreation sector and stem from the foregone Sandstone project. Positive direct impacts are projected to occur in the coal sector as a result of fuel substitution in the electric power sector.

Table II-11-WY-1. Direct Impacts for Wyoming
(Listing and Critical Habitat)
(1982$ Millions)

SECTOR	1995	2000	2005	2010	2015	2020
Livestock Feed	0.000	-0.362	-0.362	-0.362	-0.362	-0.362
Recreation	0.000	-0.111	-0.111	-0.111	-0.111	-0.111
Non-petroleum Mining	0.000	0.000	0.046	0.009	0.102	0.075
TOTAL	0.000	-0.473	-0.427	-0.464	-0.371	-0.398

Overall, the direct impacts for Wyoming are negative in each of the study years. These impacts are fairly constant over the study period. They range from a high of $0.473 million in 1995 and 2000 to a low of $0.398 million in 2020.

2. Output (Direct and Indirect) Impacts

a. Aggregate Output

For Wyoming, there are both negative direct impacts and positive direct impacts. The positive impacts occur largely as a result of the fuel substitution in the electric power industry. Since the overall direct impacts are negative, it follows that aggregate output of the State economy is negatively affected by the actions taken on behalf of the endangered fishes. By 2020 the aggregate output is $2.9 million lower than that in the without fish scenario

(Table II-11-WY-4). This represents a 0.013 percent reduction from the without fish scenario. Cumulative reductions in output over the entire study period amount to -$39.6 million (Table II-11-WY-5). At a 3 percent discount rate, the present value of these losses is -$20.0 million.

b. Sectoral Output

(1) Agriculture Sectors

The loss of the Sandstone project reduces the output of livestock feed. The total impacts to this sector are -$0.4 million in 2000 and this figure rises to -$1.7 million by 2020.

(2) Recreation Services

As a result of the endangered species actions, total output in this sector is projected to decline relative to the without fish scenario. In 2000 the output losses are projected to be -$0.1 million. By the year 2020, this loss is projected to reach -$0.6 million.

3. Employment

a. Aggregate Employment

As a result of reductions in aggregate output, total employment is projected to be lower under the actions taken on behalf of the endangered fishes. The projected changes in employment are reported in Table II-11-WY-8. The difference is approximately 8 jobs foregone in 2000 and this figure increases to 35 jobs foregone by 2020. Thus, 0.014 percent of the total jobs in the Wyoming economy are projected to be affected by the actions taken to preserve and recover the endangered fishes.

Table II-11-WY-9 reports the incremental losses by five-year interval over the study period. These losses decline very slightly over the period.

b. Sectoral Employment

(1) Agriculture Sectors

For the with fish scenario, employment in the livestock feed sector is projected to be below the levels that would arise in the without fish case (see Table II-11-WY-8). In 2000 the projection is that 3 jobs will be lost in this sector. By 2020 the loss in jobs available is projected to be 14.

(2) Recreation Services

In 2000 there will be 3 jobs fewer in the with fish scenario and this difference continues to grow until it has reached 17.7 jobs foregone by the year 2020.

4. Earnings

a. Aggregate Earnings

As employment falls, earnings fall also. This is borne out by the results reported in Table II-11-WY-12. The aggregate changes due to endangered fishes are growing slightly over time and reach -$0.3 million dollars in 2020. Cumulative losses are reported as -$4.1 million in Table II-11-WY-13. Totals for the study period are shown for various discount rates. At a 3 percent discount rate the present value of the negative impact in earnings is -$2.1 million.

5. Fiscal Effects

Both indirect business taxes and personal income taxes are negatively affected by endangered species actions. The losses for indirect business taxes are reported in Table II-11-WY-16 and amount to approximately -$0.1 million for the period from 2005 through 2020. The cumulative losses from this revenue source are reported in Table II-11-WY-17. With a 3 percent discount rate, the present value of these losses is -$0.9 million.

Personal income tax losses are reported in Table II-11-WY-20 for the model years being studied. The present value of the cumulative losses is -$0.5 million at a 3 percent discount rate (see Table II-11-WY-21).

6. Summary

The aggregate output of the Wyoming economy is projected to decline by 0.013 percent relative to the without fish scenario at the end of the study period. Particular sectors have slightly larger impacts. Output in the recreation services sector is projected to fall by 0.057 percent and in the livestock feed sector by 0.98 percent by the end of the study period.

Table II-11-WY-22 reports the present values of the cumulative deviations from the without fish scenario for each of the macroeconomic aggregates. Total output over the study period is -0.0045 percent lower under the with fish scenario.

Table II-11-WY-2. Wyoming: Output - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	398.2	392.6	384.7	370.4	358.0	341.7	320.2
Other Crops	59.6	59.1	57.9	56.0	54.3	51.8	48.5
Livestock Feed	213.1	212.2	206.7	200.7	194.1	185.0	173.4
Misc. Agriculture	27.7	29.9	32.3	34.8	36.6	37.8	38.7
Non-petroleum Mines	1956.1	1934.4	1935.2	1912.4	1880.1	1833.1	1743.3
Petroleum & Gas Production	3549.1	3405.6	3349.4	3254.5	3163.9	3059.8	2941.1
New Construction	1295.3	1388.3	1482.4	1545.1	1582.4	1607.2	1620.7
Combined Manufacturing	1104.1	1162.5	1199.6	1219.8	1228.7	1201.2	1165.5
Food Products	62.9	64.2	64.9	64.4	63.5	60.7	57.2
Wood Products	170.0	186.0	196.0	202.4	205.8	205.7	202.1
Petroleum & Coal Products	3085.4	3056.4	3066.2	3027.3	2978.8	2842.1	2666.2
Transp, Comm, & Utilities	2076.0	2239.8	2384.0	2460.1	2520.3	2564.5	2582.4
Recreation Services	738.6	817.6	892.0	959.1	1004.6	1036.5	1059.1
Electric Power Production	1720.1	1881.1	2009.6	2082.9	2125.0	2143.9	2119.7
Wholesale/Retail Trade	420.9	461.8	500.8	527.4	543.2	554.0	559.6
Finance, Insurance, Real Estate	906.2	989.6	1061.8	1112.4	1146.2	1163.4	1163.7
Household and Business Services	1176.8	1284.8	1392.0	1467.6	1515.9	1562.8	1615.9
Local Amusements	56.4	61.6	66.2	69.4	71.4	72.7	72.6
Health, Education, Social Services	544.7	603.0	659.1	699.3	722.4	733.2	735.4
Government Industries	1009.1	1072.7	1115.6	1141.3	1152.7	1158.4	1134.1
TOTAL	20570.4	21303.2	22056.5	22407.4	22547.9	22415.6	22019.4

Table II-11-WY-3. Wyoming: Output - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	398.2	392.6	384.7	370.3	358.0	341.7	320.1
Other Crops	59.6	59.1	57.9	56.0	54.3	51.8	48.5
Livestock Feed	213.1	212.2	206.3	200.0	193.0	183.7	171.7
Misc. Agriculture	27.7	29.9	32.3	34.8	36.6	37.8	38.7
Non-petroleum Mines	1956.1	1934.4	1935.2	1912.4	1880.1	1833.2	1743.5
Petroleum & Gas Production	3549.1	3405.6	3349.4	3254.5	3163.8	3059.7	2941.0
New Construction	1295.3	1388.3	1482.4	1545.1	1582.3	1607.2	1620.7
Combined Manufacturing	1104.1	1162.5	1199.5	1219.8	1228.7	1201.1	1165.4
Food Products	62.9	64.2	64.9	64.4	63.5	60.7	57.2
Wood Products	170.0	186.0	196.0	202.4	205.8	205.7	202.1
Petroleum & Coal Products	3085.4	3056.4	3066.2	3027.2	2978.7	2842.0	2666.0
Transp, Comm, & Utilities	2076.0	2239.8	2384.0	2460.0	2520.3	2564.4	2582.3
Recreation Services	738.6	817.6	891.9	958.9	1004.2	1036.0	1058.5
Electric Power Production	1720.1	1881.1	2009.6	2082.9	2125.0	2143.9	2119.7
Wholesale/Retail Trade	420.9	461.8	500.8	527.4	543.2	554.0	559.5
Finance, Insurance, Real Estate	906.2	989.6	1061.8	1112.3	1146.1	1163.3	1163.6
Household and Business Services	1176.8	1284.8	1392.0	1467.6	1515.9	1562.7	1615.9
Local Amusements	56.4	61.6	66.2	69.4	71.4	72.7	72.6
Health, Education, Social Services	544.7	603.0	659.1	699.3	722.4	733.2	735.4
Government Industries	1009.1	1072.7	1115.6	1141.2	1152.7	1158.4	1134.1
TOTAL	20570.4	21303.2	22055.8	22406.1	22546.0	22413.2	22016.6

Table II-11-WY-4. Wyoming: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	-0.4	-0.7	-1.1	-1.4	-1.7
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Petroleum & Gas Production	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Recreation Services	0.0	0.0	-0.1	-0.2	-0.4	-0.5	-0.6
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	-0.7	-1.3	-1.9	-2.4	-2.9

Table II-11-WY-5. Wyoming: Output - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-0.8	-0.4	-0.3	-0.1
Other Crops		-0.1	0.0	0.0	0.0
Livestock Feed		-22.7	-11.4	-7.4	-2.8
Misc. Agriculture		-0.3	-0.1	-0.1	0.0
Non-petroleum Mines		1.8	0.8	0.5	0.2
Petroleum & Gas Production		-1.5	-0.8	-0.5	-0.2
New Construction		-0.6	-0.3	-0.2	-0.1
Combined Manufacturing		-1.4	-0.7	-0.4	-0.2
Food Products		-0.1	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		-2.4	-1.2	-0.8	-0.3
Transp, Comm, & Utilities		-1.2	-0.6	-0.4	-0.2
Recreation Services		-8.1	-4.0	-2.6	-1.0
Electric Power Production		-0.5	-0.2	-0.2	-0.1
Wholesale/Retail Trade		-0.2	-0.1	-0.1	0.0
Finance, Insurance, Real Estate		-1.4	-0.7	-0.4	-0.2
Household and Business Services		-0.2	-0.1	-0.1	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.1	0.0	0.0	0.0
TOTAL		-39.6	-20.0	-13.0	-4.9

Table II-11-WY-6. Wyoming: Employment - Without Fish Impacts (Listing and Critical Habitat) (Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	3533.4	3399.1	3321.0	3225.3	3124.0	2981.9	2794.0
Other Crops	1389.6	1336.8	1306.0	1268.4	1228.6	1172.7	1098.8
Livestock Feed	1854.3	1783.8	1742.8	1692.6	1639.5	1564.9	1466.3
Misc. Agriculture	994.2	1073.7	1159.6	1249.9	1311.4	1354.7	1386.9
Non-petroleum Mines	18327.0	17962.3	17951.6	17739.7	17457.7	17021.2	16187.2
Petroleum & Gas Production	5088.4	4839.0	4759.2	4633.5	4513.5	4365.0	4195.7
New Construction	15138.7	16225.7	17325.8	18058.7	18493.9	18784.2	18942.0
Combined Manufacturing	8876.3	9345.9	9644.0	9807.0	9878.6	9657.3	9370.5
Food Products	839.0	856.0	865.3	858.8	847.0	810.0	763.6
Wood Products	3308.0	3617.6	3812.2	3937.3	4003.4	4001.0	3931.4
Petroleum & Coal Products	2243.8	2222.7	2229.8	2201.5	2166.2	2066.8	1938.9
Transp, Comm, & Utilities	14796.6	15964.0	16992.1	17534.2	17963.8	18278.1	18406.1
Recreation Services	20800.0	23025.6	25120.9	27010.0	28290.3	29189.9	29826.2
Electric Power Production	7694.5	8414.7	8989.5	9317.6	9505.8	9590.4	9482.0
Wholesale/Retail Trade	19222.4	21088.9	22870.9	24085.4	24805.5	25299.2	25552.2
Finance, Insurance, Real Estate	5475.5	5979.2	6415.7	6721.1	6925.4	7029.3	7031.4
Household and Business Services	15066.1	16447.6	17821.0	18788.7	19406.8	20006.5	20686.7
Local Amusements	2639.2	2884.7	3098.1	3249.9	3340.9	3404.4	3396.9
Health, Education, Social Services	14943.2	16542.2	18080.6	19183.5	19816.5	20113.8	20174.1
Government Industries	45830.4	48717.7	50666.4	51831.8	52350.1	52611.8	51507.0
TOTAL	208060.6	221727.3	234172.6	242394.9	247069.0	249303.3	248137.9

Table II-11-WY-7. Wyoming: Employment - With Fish Impacts (Listing and Critical Habitat) (Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	3533.4	3399.1	3320.8	3225.1	3123.7	2981.5	2793.5
Other Crops	1389.6	1336.8	1306.0	1268.4	1228.5	1172.6	1098.7
Livestock Feed	1854.3	1783.8	1739.7	1686.5	1630.5	1553.2	1452.2
Misc. Agriculture	994.2	1073.7	1159.4	1249.6	1311.0	1354.1	1386.2
Non-petroleum Mines	18327.0	17962.3	17951.5	17740.1	17458.1	17022.6	16189.2
Petroleum & Gas Production	5088.4	4839.0	4759.2	4633.5	4513.4	4364.9	4195.5
New Construction	15138.7	16225.7	17325.7	18058.4	18493.5	18783.8	18941.5
Combined Manufacturing	8876.3	9345.9	9643.9	9806.7	9878.1	9656.7	9369.7
Food Products	839.0	856.0	865.3	858.8	846.9	810.0	763.5
Wood Products	3308.0	3617.6	3812.2	3937.2	4003.4	4001.0	3931.4
Petroleum & Coal Products	2243.8	2222.7	2229.8	2201.4	2166.2	2066.7	1938.7
Transp, Comm, & Utilities	14796.6	15964.0	16992.0	17533.9	17963.3	18277.6	18405.4
Recreation Services	20800.0	23025.6	25117.6	27003.1	28279.8	29175.8	29808.6
Electric Power Production	7694.5	8414.7	8989.4	9317.5	9505.7	9590.3	9481.9
Wholesale/Retail Trade	19222.4	21088.9	22870.8	24085.1	24805.1	25298.6	25551.5
Finance, Insurance, Real Estate	5475.5	5979.2	6415.6	6720.8	6925.0	7028.8	7030.8
Household and Business Services	15066.1	16447.6	17821.0	18788.6	19406.7	20006.4	20686.6
Local Amusements	2639.2	2884.7	3098.1	3249.9	3340.9	3404.4	3396.9
Health, Education, Social Services	14943.2	16542.2	18080.6	19183.5	19816.5	20113.7	20174.1
Government Industries	45830.4	48717.7	50666.4	51831.7	52349.9	52611.6	51506.7
TOTAL	208060.6	221727.3	234164.9	242379.9	247046.3	249274.2	248102.5

Table II-11-WY-8. Wyoming: Employment - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.5
Other Crops	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Livestock Feed	0.0	0.0	-3.1	-6.1	-9.0	-11.7	-14.0
Misc. Agriculture	0.0	0.0	-0.1	-0.3	-0.5	-0.6	-0.8
Non-petroleum Mines	0.0	0.0	-0.1	0.4	0.4	1.4	2.1
Petroleum & Gas Production	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
New Construction	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.6
Combined Manufacturing	0.0	0.0	-0.2	-0.3	-0.5	-0.7	-0.8
Food Products	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Transp, Comm, & Utilities	0.0	0.0	-0.1	-0.3	-0.4	-0.5	-0.7
Recreation Services	0.0	0.0	-3.3	-6.9	-10.5	-14.1	-17.7
Electric Power Production	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Wholesale/Retail Trade	0.0	0.0	-0.1	-0.3	-0.4	-0.5	-0.7
Finance, Insurance, Real Estate	0.0	0.0	-0.1	-0.3	-0.4	-0.5	-0.6
Household and Business Services	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Government Industries	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3
TOTAL	0.0	0.0	-7.7	-15.0	-22.7	-29.1	-35.5

Table II-11-WY-9. Wyoming: Jobs Available
(Listing and Critical Habitat)
(Number of Jobs)

	CHANGE OF NUMBER OF JOBS AVAILABLE FOR FIVE INCREMENTAL YEARS						
INDUSTRIAL SECTORS	**1989-1995**	**1995-2000**	**2000-2005**	**2005-2010**	**2010-2015**	**2015-2020**	**TOTAL**
Livestock	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.5
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Livestock Feed	0.0	-3.1	-3.0	-2.9	-2.7	-2.4	-14.0
Misc. Agriculture	0.0	-0.1	-0.2	-0.2	-0.2	-0.2	-0.8
Non-petroleum Mines	0.0	-0.1	0.4	0.0	1.0	0.7	2.1
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
New Construction	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.6
Combined Manufacturing	0.0	-0.2	-0.2	-0.2	-0.2	-0.1	-0.8
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Transp, Comm, & Utilities	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.7
Recreation Services	0.0	-3.3	-3.5	-3.6	-3.6	-3.6	-17.7
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
Wholesale/Retail Trade	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.7
Finance, Insurance, Real Estate	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.6
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Government Industries	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.3
TOTAL	0.0	-7.7	-7.3	-7.7	-6.4	-6.4	-35.5

Table II-11-WY-10. Wyoming: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	24.0	23.7	23.2	22.4	21.6	20.6	19.3
Other Crops	5.2	5.1	5.0	4.8	4.7	4.5	4.2
Livestock Feed	7.2	7.1	7.0	6.8	6.5	6.2	5.8
Misc. Agriculture	9.4	10.2	11.0	11.9	12.4	12.9	13.2
Non-petroleum Mines	586.7	580.2	580.5	573.6	563.9	549.8	522.9
Petroleum & Gas Production	250.2	240.1	236.1	229.5	223.1	215.7	207.4
New Construction	370.9	397.6	424.5	442.5	453.1	460.3	464.1
Combined Manufacturing	201.4	212.0	218.8	222.5	224.1	219.1	212.6
Food Products	7.8	7.9	8.0	7.9	7.8	7.5	7.1
Wood Products	48.9	53.5	56.3	58.2	59.2	59.1	58.1
Petroleum & Coal Products	112.1	111.0	111.4	110.0	108.2	103.2	96.8
Transp, Comm, & Utilities	438.4	473.0	503.5	519.5	532.2	541.6	545.4
Recreation Services	216.0	239.1	260.9	280.5	293.8	303.1	309.7
Electric Power Production	228.3	249.7	266.8	276.5	282.1	284.6	281.4
Wholesale/Retail Trade	194.6	213.4	231.5	243.8	251.1	256.1	258.6
Finance, Insurance, Real Estate	109.4	119.5	128.2	134.3	138.4	140.5	140.5
Household and Business Services	366.2	399.8	433.2	456.7	471.8	486.3	502.9
Local Amusements	17.9	19.6	21.0	22.0	22.6	23.1	23.0
Health, Education, Social Services	255.6	283.0	309.3	328.2	339.0	344.1	345.1
Government Industries	965.8	1026.7	1067.7	1092.3	1103.2	1108.7	1085.4
TOTAL	4416.1	4672.3	4903.9	5043.8	5119.0	5147.0	5103.6

Table II-11-WY-11. Wyoming: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	24.0	23.7	23.2	22.4	21.6	20.6	19.3
Other Crops	5.2	5.1	5.0	4.8	4.7	4.5	4.2
Livestock Feed	7.2	7.1	7.0	6.7	6.5	6.2	5.8
Misc. Agriculture	9.4	10.2	11.0	11.8	12.4	12.9	13.2
Non-petroleum Mines	586.7	580.2	580.5	573.6	564.0	549.9	523.0
Petroleum & Gas Production	250.2	240.1	236.1	229.4	223.1	215.7	207.3
New Construction	370.9	397.6	424.5	442.5	453.1	460.2	464.1
Combined Manufacturing	201.4	212.0	218.8	222.5	224.1	219.1	212.6
Food Products	7.8	7.9	8.0	7.9	7.8	7.5	7.1
Wood Products	48.9	53.5	56.3	58.2	59.2	59.1	58.1
Petroleum & Coal Products	112.1	111.0	111.4	110.0	108.2	103.2	96.8
Transp, Comm, & Utilities	438.4	473.0	503.5	519.5	532.2	541.5	545.3
Recreation Services	216.0	239.1	260.8	280.4	293.7	303.0	309.6
Electric Power Production	228.3	249.7	266.8	276.5	282.1	284.6	281.4
Wholesale/Retail Trade	194.6	213.4	231.5	243.8	251.1	256.0	258.6
Finance, Insurance, Real Estate	109.4	119.5	128.2	134.3	138.4	140.5	140.5
Household and Business Services	366.2	399.8	433.2	456.7	471.8	486.3	502.9
Local Amusements	17.9	19.6	21.0	22.0	22.6	23.1	23.0
Health, Education, Social Services	255.6	283.0	309.3	328.2	339.0	344.1	345.1
Government Industries	965.8	1026.7	1067.7	1092.3	1103.2	1108.7	1085.4
TOTAL	4416.1	4672.3	4903.8	5043.7	5118.8	5146.8	5103.3

Table II-11-WY-12. Wyoming: Earnings - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3

Table II-11-WY-13. Wyoming: Earnings - Present Values of Differences By Sector
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-0.1	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		-0.8	-0.4	-0.2	-0.1
Misc. Agriculture		-0.1	0.0	0.0	0.0
Non-petroleum Mines		0.5	0.2	0.1	0.0
Petroleum & Gas Production		-0.1	-0.1	0.0	0.0
New Construction		-0.2	-0.1	-0.1	0.0
Combined Manufacturing		-0.2	-0.1	-0.1	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		-0.1	0.0	0.0	0.0
Transp, Comm, & Utilities		-0.3	-0.1	-0.1	0.0
Recreation Services		-2.4	-1.2	-0.8	-0.3
Electric Power Production		-0.1	0.0	0.0	0.0
Wholesale/Retail Trade		-0.1	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.2	-0.1	-0.1	0.0
Household and Business Services		-0.1	0.0	0.0	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		-0.1	0.0	0.0	0.0
TOTAL		-4.1	-2.1	-1.4	-0.5

Table II-11-WY-14. Wyoming: Indirect Business Tax - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts						
	1989	1995	2000	2005	2010	2015	2020
Livestock	13.9	13.8	13.5	13.0	12.5	12.0	11.2
Other Crops	1.3	1.3	1.3	1.2	1.2	1.1	1.1
Livestock Feed	5.9	5.9	5.7	5.6	5.4	5.1	4.8
Misc. Agriculture	0.7	0.7	0.8	0.9	0.9	0.9	1.0
Non-petroleum Mines	132.6	131.1	131.2	129.6	127.4	124.2	118.1
Petroleum & Gas Production	514.0	493.2	485.0	471.3	458.2	443.1	425.9
New Construction	7.8	8.4	9.0	9.4	9.6	9.7	9.8
Combined Manufacturing	19.1	20.1	20.8	21.1	21.3	20.8	20.2
Food Products	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Wood Products	2.6	2.9	3.0	3.1	3.2	3.2	3.1
Petroleum & Coal Products	195.6	193.7	194.3	191.9	188.8	180.1	169.0
Transp, Comm, & Utilities	115.5	124.7	132.7	136.9	140.3	142.7	143.7
Recreation Services	39.2	43.4	47.4	50.9	53.3	55.0	56.2
Electric Power Production	139.4	152.5	162.9	168.8	172.2	173.8	171.8
Wholesale/Retail Trade	69.1	75.8	82.2	86.6	89.2	90.9	91.9
Finance, Insurance, Real Estate	135.7	148.1	158.9	166.5	171.6	174.1	174.2
Household and Business Services	24.1	26.4	28.6	30.1	31.1	32.1	33.2
Local Amusements	3.0	3.2	3.5	3.6	3.7	3.8	3.8
Health, Education, Social Services	2.2	2.4	2.6	2.8	2.9	2.9	2.9
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1422.3	1448.2	1483.9	1493.9	1493.4	1476.3	1442.5

Table II-11-WY-15. Wyoming: Indirect Business Tax - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Tax						
	1989	1995	2000	2005	2010	2015	2020
Livestock	13.9	13.8	13.5	13.0	12.5	12.0	11.2
Other Crops	1.3	1.3	1.3	1.2	1.2	1.1	1.1
Livestock Feed	5.9	5.9	5.7	5.5	5.4	5.1	4.8
Misc. Agriculture	0.7	0.7	0.8	0.9	0.9	0.9	1.0
Non-petroleum Mines	132.6	131.1	131.2	129.6	127.4	124.2	118.2
Petroleum & Gas Production	514.0	493.2	485.0	471.3	458.2	443.1	425.9
New Construction	7.8	8.4	9.0	9.4	9.6	9.7	9.8
Combined Manufacturing	19.1	20.1	20.8	21.1	21.3	20.8	20.2
Food Products	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Wood Products	2.6	2.9	3.0	3.1	3.2	3.2	3.1
Petroleum & Coal Products	195.6	193.7	194.3	191.9	188.8	180.1	169.0
Transp, Comm, & Utilities	115.5	124.7	132.7	136.9	140.3	142.7	143.7
Recreation Services	39.2	43.4	47.3	50.9	53.3	55.0	56.2
Electric Power Production	139.4	152.5	162.9	168.8	172.2	173.7	171.8
Wholesale/Retail Trade	69.1	75.8	82.2	86.6	89.2	90.9	91.8
Finance, Insurance, Real Estate	135.7	148.1	158.9	166.5	171.6	174.1	174.2
Household and Business Services	24.1	26.4	28.6	30.1	31.1	32.1	33.2
Local Amusements	3.0	3.2	3.5	3.6	3.7	3.8	3.8
Health, Education, Social Services	2.2	2.4	2.6	2.8	2.9	2.9	2.9
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1422.3	1448.2	1483.9	1493.9	1493.3	1476.2	1442.3

Table II-11-WY-16. Wyoming: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1

Table II-11-WY-17. Wyoming: Indirect Business Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		-0.6	-0.3	-0.2	-0.1
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		0.1	0.1	0.0	0.0
Petroleum & Gas Production		-0.2	-0.1	-0.1	0.0
New Construction		0.0	0.0	0.0	0.0
Combined Manufacturing		0.0	0.0	0.0	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		-0.2	-0.1	0.0	0.0
Transp, Comm, & Utilities		-0.1	0.0	0.0	0.0
Recreation Services		-0.4	-0.2	-0.1	-0.1
Electric Power Production		0.0	0.0	0.0	0.0
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		-0.2	-0.1	-0.1	0.0
Household and Business Services		0.0	0.0	0.0	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-1.7	-0.9	-0.6	-0.2

Table II-11-WY-18. Wyoming: Personal Income Tax - Without Fish Impacts (Listing and Critical Habitat)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	6.0	5.9	5.8	5.6	5.4	5.2	4.8
Other Crops	1.3	1.3	1.3	1.2	1.2	1.1	1.0
Livestock Feed	1.8	1.8	1.7	1.7	1.6	1.6	1.5
Misc. Agriculture	2.4	2.5	2.7	3.0	3.1	3.2	3.3
Non-petroleum Mines	146.7	145.1	145.1	143.4	141.0	137.5	130.7
Petroleum & Gas Production	62.6	60.0	59.0	57.4	55.8	53.9	51.8
New Construction	92.7	99.4	106.1	110.6	113.3	115.1	116.0
Combined Manufacturing	50.3	53.0	54.7	55.6	56.0	54.8	53.1
Food Products	1.9	2.0	2.0	2.0	2.0	1.9	1.8
Wood Products	12.2	13.4	14.1	14.5	14.8	14.8	14.5
Petroleum & Coal Products	28.0	27.8	27.8	27.5	27.0	25.8	24.2
Transp, Comm, & Utilities	109.6	118.2	125.9	129.9	133.1	135.4	136.3
Recreation Services	54.0	59.8	65.2	70.1	73.4	75.8	77.4
Electric Power Production	57.1	62.4	66.7	69.1	70.5	71.2	70.3
Wholesale/Retail Trade	48.6	53.4	57.9	60.9	62.8	64.0	64.7
Finance, Insurance, Real Estate	27.4	29.9	32.1	33.6	34.6	35.1	35.1
Household and Business Services	91.6	100.0	108.3	114.2	117.9	121.6	125.7
Local Amusements	4.5	4.9	5.3	5.5	5.7	5.8	5.8
Health, Education, Social Services	63.9	70.7	77.3	82.0	84.7	86.0	86.3
Government Industries	241.5	256.7	266.9	273.1	275.8	277.2	271.4
TOTAL	1104.0	1168.1	1226.0	1260.9	1279.7	1286.8	1275.9

Table II-11-WY-19. Wyoming: Personal Income Tax - With Fish Impacts (Listing and Critical Habitat)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	6.0	5.9	5.8	5.6	5.4	5.2	4.8
Other Crops	1.3	1.3	1.3	1.2	1.2	1.1	1.0
Livestock Feed	1.8	1.8	1.7	1.7	1.6	1.5	1.4
Misc. Agriculture	2.4	2.5	2.7	3.0	3.1	3.2	3.3
Non-petroleum Mines	146.7	145.1	145.1	143.4	141.0	137.5	130.7
Petroleum & Gas Production	62.6	60.0	59.0	57.4	55.8	53.9	51.8
New Construction	92.7	99.4	106.1	110.6	113.3	115.1	116.0
Combined Manufacturing	50.3	53.0	54.7	55.6	56.0	54.8	53.1
Food Products	1.9	2.0	2.0	2.0	2.0	1.9	1.8
Wood Products	12.2	13.4	14.1	14.5	14.8	14.8	14.5
Petroleum & Coal Products	28.0	27.8	27.8	27.5	27.0	25.8	24.2
Transp, Comm, & Utilities	109.6	118.2	125.9	129.9	133.1	135.4	136.3
Recreation Services	54.0	59.8	65.2	70.1	73.4	75.7	77.4
Electric Power Production	57.1	62.4	66.7	69.1	70.5	71.2	70.3
Wholesale/Retail Trade	48.6	53.4	57.9	60.9	62.8	64.0	64.7
Finance, Insurance, Real Estate	27.4	29.9	32.1	33.6	34.6	35.1	35.1
Household and Business Services	91.6	100.0	108.3	114.2	117.9	121.6	125.7
Local Amusements	4.5	4.9	5.3	5.5	5.7	5.8	5.8
Health, Education, Social Services	63.9	70.7	77.3	82.0	84.7	86.0	86.3
Government Industries	241.5	256.7	266.9	273.1	275.8	277.2	271.4
TOTAL	1104.0	1168.1	1226.0	1260.9	1279.7	1286.7	1275.8

Table II-11-WY-20. Wyoming: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1

Table II-11-WY-21. Wyoming: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		0.0	0.0	0.0	0.0
Other Crops		0.0	0.0	0.0	0.0
Livestock Feed		-0.2	-0.1	-0.1	0.0
Misc. Agriculture		0.0	0.0	0.0	0.0
Non-petroleum Mines		0.1	0.1	0.0	0.0
Petroleum & Gas Production		0.0	0.0	0.0	0.0
New Construction		0.0	0.0	0.0	0.0
Combined Manufacturing		-0.1	0.0	0.0	0.0
Food Products		0.0	0.0	0.0	0.0
Wood Products		0.0	0.0	0.0	0.0
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		-0.1	0.0	0.0	0.0
Recreation Services		-0.6	-0.3	-0.2	-0.1
Electric Power Production		0.0	0.0	0.0	0.0
Wholesale/Retail Trade		0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate		0.0	0.0	0.0	0.0
Household and Business Services		0.0	0.0	0.0	0.0
Local Amusements		0.0	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		-1.0	-0.5	-0.3	-0.1

Table II-11-WY-22. Wyoming: Present Value Deviations from Without Fish Impacts (Listing and Critical Habitat) (Percentage Change)

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.0056	-0.0045	-0.0038	-0.0024
Earnings	-0.0027	-0.0021	-0.0018	-0.0012
Indirect Business Taxes	-0.0037	-0.0029	-0.0024	-0.0015
Personal Income Taxes	-0.0027	-0.0021	-0.0018	-0.0012

Volume II

Chapter 12: The Colorado River Basin Impacts

A. Introduction

The State-level and the Colorado Basin I-O model stages are examples of what Miernyk (1965) refers to as "small-area" I-O studies. That is, each of the model stages employs an I-O model structure that is similar to that used to construct national level models. In Chapter II-7 the concept on economic linkages was developed and it was shown that these linkages described the degree of integration of a regional economy. The stronger the linkages, the more integrated the economy. In general, the multipliers will be larger in larger economies as will be the indirect impacts. This is demonstrated by the data reported in Table II-12-1. In virtually all cases, the sector multiplier is larger for the Basin economy than for an individual State. From this result, it follows that the projected aggregate impacts will be greater for the Basin model than for the summation of the individual State results.

Analyzing the output of the Basin model enables the identification of the overall impacts that net out gainers and losers. From the State-level results presented in Chapter II-11, it is clear that California and Colorado would benefit from actions taken to preserve and recover the endangered species. It is just as clear that New Mexico, Utah, Arizona, Nevada, and Wyoming would lose from these actions. In this chapter the focus is on the impacts for the economy of the region comprised of the seven States making up the study area. This allows identification of the sectoral gainers and losers as well as the spatial gainers and losers.

Table II-12-1. Output Multipliers by Sector Various Regions

Sector	Region/State Colorado River Basin Region	California	Colorado	New Mexico
Livestock	2.0424	1.7696	1.6948	1.7478
Other Crops	1.5248	1.4761	1.3861	1.3531
Livestock Feed	1.6852	1.6205	1.4257	1.4633
Misc. Agric.	1.5099	1.4757	1.2735	1.3388
Non-petro. Mines	1.4181	1.4247	1.2899	1.3379
Petro./Gas Mines	1.4001	1.3659	1.3143	1.2936
New Construction	1.4475	1.4411	1.2967	1.2717
Combined Mfg.	1.4264	1.3996	1.2772	1.2799
Food Prods.	1.7449	1.6494	1.5731	1.4830
Wood Prods.	1.4035	1.3969	1.2814	1.3264
Petro./Coal Prods.	1.8724	1.7062	1.6685	1.8054
Tr. Comm. Util.	1.4465	1.3762	1.2972	1.5734
Recreation Serv.	1.6696	1.6301	1.4449	1.3602
Elec. Power Prod.	1.6505	1.5555	1.3812	1.5102
Whol. Retail Trade	1.3627	1.3433	1.2581	1.2434
F.I.R.E.	1.3377	1.3311	1.2758	1.2125
Hhold/Bus. Serv.	1.3642	1.3482	1.2726	1.2190
Local Amus.	1.7360	1.8059	1.4229	1.3709
Health, Ed, Soc.Srv.	1.5111	1.4803	1.3665	1.3158
Govt Ind.	1.0813	1.0744	1.0852	1.0403

B. Direct Impacts

The direct impacts for each of the Colorado River Basin States associated with implementing the requirements of the endangered fishes were described at the State level in Chapter II-10. Direct impacts have been estimated for all States and these were used as the inputs for the State-level analyses reported in Chapter II-11. To obtain the direct impacts at the regional level, the individual State-level direct impacts were aggregated, which involved netting out effects across States. It is useful to summarize these impacts here since these are the inputs to the region I-O model. Table II-12-2 reports this input scenario. Overall, the direct impacts are projected to be positive across the Colorado River Basin States as a region. The direct impacts are negative throughout the entire study period for some sectors: livestock feed, recreation, and electric power. Other sectors have positive direct impacts throughout the study period: other crops; non-petroleum mining, oil and gas mining; construction; and combined manufacturing. The other crops sector impacts reflect the geographic shift of water use in agriculture from the Upper Basin States to the Lower Basin States. The remaining positive effects arise as a result of the negative impacts in electric power production. Fuel substitution leads to increased use of gas and coal. The construction of additional thermal capacity leads to positive impacts in construction and capital equipment.

For the Colorado Basin, there are both negative direct impacts and positive direct impacts. The net effects of these offsetting direct impacts is that the total direct impacts for the Colorado River Basin are positive throughout the study period.

Table II-12-2. Direct Impacts for the Colorado River Basin (1982$ Millions)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	-3.053	-6.167	-11.340	-13.559	-18.109	-23.359
Other Crops	5.925	12.358	27.378	36.532	53.144	69.629
Recreation	-2.558	-3.686	-3.936	-4.186	-4.436	-4.686
Electric Power	-3.958	-4.120	-8.177	-4.668	-9.664	-0.437
Non-petroleum Mining	2.409	3.394	4.555	3.515	2.130	3.711
Oil and Gas Mining	1.608	1.147	3.463	2.500	8.063	1.680
Construction	6.35	6.35	6.35	6.35	6.35	6.35
Combined Manufacturing	6.35	6.35	6.35	6.35	6.35	6.35
TOTAL DIRECT IMPACTS	12.238	15.626	24.643	32.834	43.828	59.238

C. Output (Direct and Indirect) Impacts

1. Aggregate Output

The levels of output projected for the Colorado River Basin region economy are reported in Tables II-12-3 (without fish) and II-12-4 (with fish). As a result of the endangered fishes impacts (listing and critical habitat), the total annual output in the Colorado River Basin economy is projected to increase relative to the without fish level by $16.2 million in 1995. These positive total impacts continue through the entire study period. By the year 2020 the aggregate output in the with fish scenario is projected to be $248.3 million above the without fish scenario. The sum of the output increases over the study period are reported in Table II-12-5. The present value of the stream of these annual output increases is $1,390.7 million at a 3 percent discount rate (Table II-12-6).

The time path of the output differences (Table II-12-5) illustrates the compounding effect the economy receives from previous positive impacts. Between 1995 and 2000 the change in the annual difference in output is projected to be approximately $20 million and between 2015 and 2020 this change has increased to $78 million.

To place this increase in perspective, the projected annual aggregate output increases can be compared to the without fish level of output. In 1995, the actions in the with fish scenario lead to a 0.0012 percent increase in aggregate output. By 2020 the resulting increase constitutes 0.016 percent. Over time the contribution to the Basin economy of the with fish impacts grows.

2. Sectoral Output Impacts

The discussion of the sectoral output impacts in the Colorado Basin economy begins with those sectors projected to face direct impacts as a result of the actions taken on behalf of the endangered species. Selected sectors experiencing indirect impacts are then discussed.

Table II-12-3. Colorado River Basin: Output - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

Industrial Sectors	1989	1995	2000	2005	2010	2015	2020
Livestock	12164.0	11994.4	11752.8	11325.5	10948.3	10439.9	9782.2
Other Crops	12910.5	12817.3	12546.8	12138.3	11768.6	11222.2	10515.2
Livestock Feed	4547.9	4528.3	4411.3	4284.2	4141.7	3949.4	3700.6
Misc. Agriculture	7700.8	8325.2	8991.2	9701.3	1078.6	10514.5	10764.8
Non-petroleum Mines	11392.2	11266.0	11270.4	11137.4	10949.5	10675.7	10152.6
Petroleum & Gas Production	30621.9	29383.6	28898.7	28368.5	27861.9	27223.9	26439.9
New Construction	97499.1	104499.5	11270.4	116304.6	119107.6	120977.6	121993.8
Combined Manufacturing	231614.7	243867.2	251646.5	255899.4	257767.4	257148.8	254654.4
Food Products	48782.7	49768.1	50310.6	50687.9	50622.0	50439.8	50066.5
Wood Products	30801.5	33684.5	35496.8	36661.0	37277.0	37299.3	37362.7
Petroleum & Coal Products	46707.7	42628.7	46416.7	46291.4	46217.3	45482.5	44941.2
Transp, Comm, & Utilities	65015.7	70145.4	74662.8	77044.6	78932.1	80313.5	80875.7
Recreation Services	96910.1	107279.5	117041.9	125843.5	131808.4	136000.0	138964.7
Electric Power Production	19142.2	20933.9	22363.7	23180.0	23648.2	23858.7	23589.1
Wholesale/Retail Trade	62731.3	68822.5	74638.0	78601.2	80951.4	82562.3	82537.6
Finance, Insurance, Real Estate	187892.6	205178.8	220156.8	230636.3	237647.6	241212.3	241284.7
Household & Business Services	110461.1	120590.4	130659.7	137754.6	142286.7	146683.3	151142.5
Local Amusements	24484.4	26761.5	28741.8	30150.2	30994.4	31611.2	31680.7
Health, Education, Social Services	80713.8	89350.2	97659.8	10367.0	10736.4	108641.9	108967.8
Government Industries	79649.2	84557.1	88053.7	90079.0	92781.4	94637.0	96624.4
TOTAL	1261743.7	1350131.9	1427304.7	1479705.8	1512926.5	1530893.8	1536041.1

Table II-12-4. Colorado River Basin: Output - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	12164.0	11994.2	11752.5	11325.0	10947.7	10439.1	9781.2
Other Crops	12910.5	12823.3	12565.2	12183.8	11849.7	11353.4	10708.7
Livestock Feed	4547.9	4524.8	4401.6	4263.3	4107.6	3898.5	3629.2
Misc. Agriculture	7700.8	8325.6	8992.5	9704.5	10184.5	10524.3	10779.6
Non-petroleum Mines	11392.2	11268.5	11276.4	11148.0	10963.6	10691.6	10171.8
Petroleum & Gas Production	30621.9	29385.1	28901.4	28374.5	27870.7	27241.0	26459.3
New Construction	97499.1	104505.8	111597.6	116324.6	119134.7	121012.0	122035.8
Combined Manufacturing	231614.7	243874.9	251662.4	255923.6	257800.3	257190.4	254705.0
Food Products	48782.7	49767.9	50310.1	50687.1	50620.9	50438.3	50064.7
Wood Products	30801.5	33684.8	35497.4	36662.3	37278.9	37302.2	37366.8
Petroleum & Coal Products	46707.7	46268.4	46416.3	46290.7	46217.3	45482.9	44944.2
Transp, Comm, & Utilities	65015.7	70145.5	74662.9	77044.6	78932.7	80314.3	80878.2
Recreation Services	96910.1	107277.0	117035.8	125833.3	131794.1	135981.4	138942.0
Electric Power Production	19142.2	20930.2	22355.8	23164.0	23627.8	23829.0	23560.1
Wholesale/Retail Trade	62731.3	68822.7	74638.5	78602.1	80952.7	82564.1	82539.9
Finance, Insurance, Real Est.	187892.6	205179.3	220158.0	230639.1	237652.7	241221.2	241297.8
Household and Business Serv.	110461.1	120591.3	130661.6	137757.7	142291.3	146689.8	151151.2
Local Amusements	24484.4	26761.5	28741.8	30150.2	30994.5	31611.3	31681.0
Health, Education, Social Serv.	80713.8	89350.2	97659.8	103617.0	107036.4	108642.0	108968.0
Government Industries	79649.2	84667.1	88053.8	90079.1	92781.5	94637.3	96624.8
TOTAL	1261743.7	1350148.1	1427341.4	1479774.5	1513039.5	1531063.9	1536289.4

Table II-12-5. Colorado River Basin: Output - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	-0.1	-0.3	-0.5	-0.7	-0.8	-1.0
Other Crops	0.0	6.0	18.4	45.5	81.1	131.2	193.5
Livestock Feed	0.0	-3.5	-9.7	-20.9	-34.0	-50.9	-71.4
Misc. Agriculture	0.0	0.4	1.2	3.2	5.9	9.7	14.8
Non-petroleum Mines	0.0	2.5	6.0	10.6	14.1	15.8	19.1
Petroleum & Gas Production	0.0	1.5	2.6	6.0	8.8	17.1	19.5
New Construction	0.0	6.3	13.0	20.0	27.1	34.4	42.0
Combined Manufacturing	0.0	7.7	15.8	24.2	32.9	41.6	50.5
Food Products	0.0	-0.2	-0.5	-0.9	-1.2	-1.5	-1.8
Wood Products	0.0	0.3	0.7	1.2	1.9	2.9	4.0
Petroleum & Coal Products	0.0	-0.2	-0.4	-0.7	0.0	0.4	3.0
Transp, Comm, & Utilities	0.0	0.0	0.1	0.0	0.6	0.8	2.6
Recreation Services	0.0	-2.4	-6.1	-10.2	-14.3	-18.6	-22.7
Electric Power Production	0.0	-3.8	-7.9	-16.0	-20.5	-29.7	-29.0
Wholesale/Retail Trade	0.0	0.3	0.5	0.9	1.3	1.8	2.3
Finance, Insurance, Real Estate	0.0	0.5	1.2	2.9	5.1	8.9	13.1
Household and Business Services	0.0	0.9	1.9	3.2	4.6	6.4	8.7
Local Amusements	0.0	0.0	0.0	0.0	0.1	0.2	0.3
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Government Industries	0.0	0.0	0.1	0.1	0.2	0.3	0.5
TOTAL	0.0	16.2	36.7	68.8	113.0	170.1	248.3

Table II-12-6. Colorado River Basin: Output - Present Values of Differences By Sector (Listing and Critical Habitat)
(1982$ Millions)

		Direct and Indirect Impacts			
INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-15.1	-7.8	-5.2	-2.2
Other Crops		1994.3	972.0	621.1	226.6
Livestock Feed		-811.0	-403.5	-261.9	-99.8
Misc. Agriculture		146.8	71.0	45.2	16.2
Non-petroleum Mines		304.1	160.4	108.5	46.0
Petroleum & Gas Production	239.1	119.3	77.7	30.2	
New Construction		633.4	334.3	226.6	97.2
Combined Manufacturing		766.8	405.0	274.8	118.1
Food Products		-26.8	-14.0	-9.4	-4.0
Wood Products		47.2	23.8	15.6	6.2
Petroleum & Coal Products	4.2	0.0	-1.0	-1.4	
Transp, Comm, & Utilities		15.5	7.1	4.3	1.4
Recreation Services		-327.4	-170.2	-114.0	-47.3
Electric Power Production		-477.8	-248.8	-166.8	-69.2
Wholesale/Retail Trade		31.1	16.1	10.7	4.4
Finance, Insurance, Real Estate		132.3	64.3	41.1	15.0
Household and Business Services		111.5	57.4	38.2	15.7
Local Amusements		2.2	1.0	0.6	0.2
Health, Education, Social Services		1.6	0.8	0.5	0.2
Government Industries		4.9	2.5	1.6	0.6
TOTAL		2776.8	1390.7	908.2	354.2

a. Other Crops Sector

This sector is a major beneficiary of the actions that are projected to be taken to preserve and recover the endangered fishes. The shift in water resources to the lower Basin results in increased output in this sector throughout the entire study period. The sum of the increases over the study period (Table II-12-6) amount to $1,994.3 million. At a 3 percent discount rate, the present value of these increases is $972 million.

b. Livestock Feed Sector

The movement of water from the Upper Basin to the Lower Basin leads to a net reduction in this sector. When the water is used in California it goes to the higher valued crops, and livestock feed is not one of these. This is borne out in the direct impacts reported in Table II-12-2 above. Livestock feed is projected to experience negative direct impacts and these translate into negative total impacts as reported in Table II-12-5. Losses start at $3.5 million in 1995, increase through the period, and to grow to $71 million by 2020. Over the entire study period the sum of these losses is $811 million (with a present value at 3 percent of $403.5 million).

c. Recreation Services Sector

Chapters II-9 and II-10 described several recreational activities that would be adversely affected by the endangered species listing and critical habitat.[69] The aggregate direct impact reported in Table II-12-2 was negative. The overall impact is also negative. In 1995 the level of economic activity in this sector is projected to be $2.4 million less than that in the without fish scenario (Table II-12-5). This loss amounts to 0.002 percent of the projected without fish scenario output. The negative impact continues and by 2020 the loss of output in the recreation services sector is $22.7 million. At 3 percent the present value of these losses is $170.1 million.

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[69] It was also noted that some activities may benefit from endangered species but these were not fully quantifiable at this time.

d. Coal and Gas Effects[70]

The respective sectors encompassing these industries experience positive direct impacts as a result of changes in hydroelectric generation that are required to preserve and recover the endangered fishes. Of course, the overall increase in the level of economic activity in the region will also contribute to output increases in these sectors. Thus, petroleum and gas production is projected to increase relative to the without fish scenario. The increase in 1995 is $1.5 million and the increase continues through 2020 when it reaches $19.5 million. Similar output effects occur in the non-petroleum mines sector (which includes coal mines)[71] where output changes are projected at $2.5 million in 1995 and $19.1 million in 2020.

e. Electric Power Production

Although thermal capacity is to be added to this sector, the net effect is still negative. Annual output losses are projected to be $3.8 million in 1995, $7.9 million in 2000, and so on until 2020 when the annual losses are projected to be $29 million (see Table II-12-5). These losses represent 0.018 percent of the 1995 without fish level, 0.035 percent of the 2000 without fish level, and 0.12 percent of the 2020 without fish level.

f. Construction Impacts

The Stone and Webster Consultants, Inc. projections call for expansion in thermal capacity that is directly attributable to the hydroelectric impacts of endangered species. This expansion is represented as direct impacts in the construction and capital equipment (combined manufacturing) sectors. These direct impacts lead to economic expansion, which reflects back into these sectors. The total output effects of this expansion are recorded in Table II-12-5. In 1995 output is projected to increase by $6.3 million in the construction sector and $7.7 million in the combined manufacturing sector. By 2020 the combined output impacts for these two sectors is $92.5 million.

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[70] As noted in Chapters II-9 and II-10, there are no direct effects projected for oil and gas production as a result of endangered species. However, there are the impacts caused by the fuel substitutions that are projected to occur as a result of the restrictions placed on hydropower production.

[71] This sector also includes sand and gravel quarry operations that may exist in floodplains and thus be required to adjust operations (negative impacts). At this time there are no data available concerning these impacts.

g. Purely Indirect Impacts

Inherent to the I-O method is the identification of various effects that occur beyond the direct impact sectors. A clear example of this in the Basin economy model is the miscellaneous agriculture sector, which is projected to receive positive impacts as a spinoff from the growth of the other crops sector. In 1995 the output impact is $0.4 million; in 2000, $1.2 million; in 2010, $5.9 million, and so on (see Table II-12-5). The cumulative gains in output are $146.8 million (the present value of this at 3 percent discount rate is $71 million).

The finance, insurance, and real estate sector experiences a positive impact throughout the entire study period. The output impact is $1.2 million in 2000 and increases along with the overall impacts through 2020 when it reaches $13.1 million.

D. Employment Impacts

1. Total Employment Impacts

Employment levels by sector and in total are reported in Tables II-12-7 (for the without fish scenario) and II-12-8 (for the with fish scenario). These represent annual employment levels within the Basin for various years throughout the study period. Since employment and output are positively correlated, it follows that employment should increase as a result of actions taken to preserve and recover the species. The results reported in Table II-12-9 confirm this. Total annual employment increases throughout the study period. In 1995 the projected increase is some 300 jobs. By 2020 the annual increase is projected to be over 6,500 jobs. Table II-12-10 reports the increases in annual jobs in five-year increments. The results clearly show that the increases in total annual employment levels are growing over time. That is, the difference between the without fish projections and those with fish impacts is projected to increase.

Table II-12-7. Colorado River Basin: Employment - Without Fish Impacts (Listing and Critical Habitat) (Number of Persons)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	135426.2	130280.0	127283.5	123617.8	119736.2	114288.2	107088.0
Other Crops	374361.8	360136.1	351853.0	341719.6	330989.6	315929.6	296026.0
Livestock Feed	43444.9	41793.9	40832.7	39656.7	38411.5	36663.8	34353.9
Misc. Agriculture	348161.1	376014.0	406095.1	437729.9	459266.2	474422.0	485713.2
Non-petroleum Mines	125126.6	122636.5	122562.9	121116.7	119191.0	116211.2	110516.8
Petroleum & Gas Production	48441.2	46067.5	45307.4	44564.4	43855.8	42851.5	41617.4
New Construction	1033496.2	1107701.3	1182803.4	1232836.0	1262547.4	1282369.3	1293141.2
Combined Manufacturing	2661659.2	2802461.0	2891859.5	2940731.9	2962199.3	2955090.0	2926425.6
Food Products	275840.5	281412.5	284479.9	286613.5	286240.9	285210.4	283099.8
Wood Products	423128.2	462732.9	487628.0	503622.2	512083.0	512390.3	513261.3
Petroleum & Coal Products	33295.0	32982.0	33087.5	32998.2	32945.4	32421.6	32035.8
Transp, Comm, & Utilities	758006.8	817813.6	870480.8	898249.1	920256.2	936360.7	942915.2
Recreation Services	2224502.0	2462523.7	2686613.4	2888646.7	3025568.6	3121781.6	3189836.5
Electric Power Production	95926.0	104904.7	112069.7	116160.2	118506.7	119561.4	118210.3
Wholesale/Retail Trade	3242896.1	3557781.3	3858413.8	4063295.6	4184788.1	4268065.4	4266785.0
Finance, Insurance, Real Est.	1287622.2	1406083.4	1508727.5	1580543.0	1628591.5	1653020.3	1653516.2
Household and Business Serv.	2060356.0	2249290.6	2437106.4	2569441.2	2653975.9	2735983.7	2819157.6
Local Amusements	402944.0	440417.7	473008.7	496186.1	510079.3	520229.9	521374.4
Health, Education, Soc. Serv.	1941488.9	2149228.2	2349106.4	2492401.9	2574651.2	2613271.0	2621110.8
Government Industries	3568511.2	3793327.4	3945060.5	4035796.9	4156870.8	4240008.2	4329048.4
TOTAL	21084633.8	22745588.3	24214379.9	25245927.4	25940754.4	26376129.8	26585233.5

Table II-12-8. Colorado River Basin: Employment - With Fish Impacts (Listing and Critical Habitat) (Number of Persons)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	135426.2	130278.8	127280.6	123612.5	119728.9	114278.9	107076.7
Other Crops	374361.8	360304.3	352367.8	343000.1	333270.9	319623.3	301473.9
Livestock Feed	43444.9	41761.8	40743.0	39462.8	38095.8	36191.6	33691.3
Misc. Agriculture	348161.1	376031.5	406151.0	437874.0	459530.7	474861.6	486381.5
Non-petroleum Mines	125126.6	122663.8	122628.6	121232.1	119344.5	116383.6	110725.0
Petroleum & Gas Production	48441.2	46070.0	45311.5	44573.8	43869.6	42878.4	41648.1
New Construction	1033496.2	1107768.1	1182941.7	1233047.5	1262834.7	1282734.0	1293587.0
Combined Manufacturing	2661659.2	2802550.0	2892041.4	2941010.5	2962576.8	2955567.9	2927006.5
Food Products	275840.5	281411.2	284476.9	286608.6	286234.2	285201.9	283089.7
Wood Products	423128.2	462736.9	487637.1	503639.1	512109.8	512429.5	513316.7
Petroleum & Coal Products	33295.0	32981.8	33087.2	32997.7	32945.4	32421.9	32037.9
Transp, Comm, & Utilities	758006.8	817814.0	870482.2	898249.5	920262.6	936370.2	942945.2
Recreation Services	2224502.0	2462467.9	2686472.9	2888413.5	3025239.6	3121355.3	3189315.1
Electric Power Production	95926.0	104885.8	112030.0	116080.2	118404.1	119412.6	118065.1
Wholesale/Retail Trade	3242896.1	3557794.5	3858442.2	4063342.3	4184855.7	4268157.7	4266904.9
Finance, Insurance, Real Est.	1287622.2	1406086.8	1508735.6	1580562.5	1628626.6	1653081.4	1653606.0
Household and Business Serv.	2060356.0	2249307.3	2437141.6	2569500.1	2654062.2	2736103.4	2819319.9
Local Amusements	402944.0	440417.7	473008.7	496186.5	510080.6	520232.4	521379.2
Health, Education, Soc. Serv.	1941488.9	2149228.4	2349106.9	2492402.8	2574652.7	2613273.3	2621114.5
Government Industries	3568511.2	3793328.7	3945063.3	4035801.8	4156879.5	4240021.5	4329070.2
TOTAL	21084633.8	22745889.2	24215150.2	25247598.0	25943604.7	26380580.5	26591754.4

Table II-12-9. Colorado River Basin: Employment - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	-1.2	-3.0	-5.2	-7.3	-9.3	-11.3
Other Crops	0.0	168.2	514.8	1280.5	2281.3	3693.8	5447.9
Livestock Feed	0.0	-32.2	-89.7	-193.9	-315.7	-472.1	-662.6
Misc. Agriculture	0.0	17.6	56.0	144.1	264.5	439.6	668.3
Non-petroleum Mines	0.0	27.2	65.6	115.4	153.5	172.5	208.2
Petroleum & Gas Production	0.0	2.4	4.1	9.4	13.8	26.8	30.7
New Construction	0.0	66.8	138.3	211.5	287.3	364.7	445.7
Combined Manufacturing	0.0	89.0	181.9	278.5	377.5	477.9	580.9
Food Products	0.0	-1.2	-3.0	-4.8	-6.6	-8.4	-10.2
Wood Products	0.0	4.0	9.1	17.0	26.7	39.3	55.4
Petroleum & Coal Products	0.0	-0.2	-0.3	-0.5	0.0	0.3	2.1
Transp, Comm, & Utilities	0.0	0.4	1.4	0.4	6.4	9.5	30.0
Recreation Services	0.0	-55.8	-140.4	-233.2	-329.0	-426.4	-521.4
Electric Power Production	0.0	-18.9	-39.7	-80.0	-102.6	-148.8	-145.2
Wholesale/Retail Trade	0.0	13.2	28.3	46.7	67.6	92.2	119.9
Finance, Insurance, Real Estate	0.0	3.4	8.0	19.6	35.1	61.0	89.7
Household and Business Services	0.0	16.7	35.3	58.9	86.3	119.7	162.3
Local Amusements	0.0	0.0	0.0	0.4	1.3	2.5	4.8
Health, Education, Social Services	0.0	0.2	0.4	0.9	1.5	2.3	3.7
Government Industries	0.0	1.3	2.8	4.9	8.8	13.3	21.8
TOTAL	0.0	300.9	770.2	1670.6	2850.5	4450.6	6520.7

Table II-12-10. Colorado River Basin: Jobs Available (Listing and Critical Habitat)
(Number of Jobs)

	Change of Number of Jobs Available for Five Incremental Years						
INDUSTRIAL SECTORS	1989-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	TOTAL
Livestock	-1.2	-1.8	-2.3	-2.1	-2.0	-2.1	-11.3
Other Crops	168.2	346.6	765.7	1000.7	1412.5	1754.2	5447.9
Livestock Feed	-32.2	-57.5	-104.3	-121.8	-156.4	-190.5	-662.6
Misc. Agriculture	17.6	38.4	88.1	120.4	175.1	228.7	668.3
Non-petroleum Mines	27.2	38.4	49.7	38.2	18.9	35.7	208.2
Petroleum & Gas Production	2.4	1.7	5.3	4.4	13.1	3.8	30.7
New Construction	66.8	71.5	73.3	75.8	77.4	81.0	445.7
Combined Manufacturing	89.0	92.9	96.6	99.0	100.4	103.0	580.9
Food Products	-1.2	-1.8	-1.8	-1.8	-1.8	-1.7	-10.2
Wood Products	4.0	5.1	7.9	9.8	12.5	16.1	55.4
Petroleum & Coal Products	-0.2	-0.1	-0.2	0.5	0.3	1.8	2.1
Transp, Comm, & Utilities	0.4	1.0	-1.0	6.0	3.1	20.5	30.0
Recreation Services	-55.8	-84.6	-92.7	-95.8	-97.4	-95.0	-521.4
Electric Power Production	-18.9	-20.7	-40.3	-22.6	-46.2	3.6	-145.2
Wholesale/Retail Trade	13.2	15.2	18.3	20.9	24.6	27.7	119.9
Finance, Insurance, Real Estate	3.4	4.7	11.5	15.6	25.9	28.7	89.7
Household and Business Services	16.7	18.6	23.6	27.5	33.4	42.5	162.3
Local Amusements	0.0	0.1	0.4	0.9	1.2	2.3	4.8
Health, Education, Social Services	0.2	0.2	0.4	0.7	0.8	1.3	3.7
Government Industries	1.3	1.5	2.1	3.9	4.6	8.5	21.8
TOTAL	300.9	469.3	900.4	1179.9	1600.1	2070.2	6520.7

2. Sectoral Employment Impacts

a. Other Crops

Employment in this sector increases along with the output. In 1995 the employment increases in this sector by 168 jobs (0.047 percent of the without fish level). By 2020 the gain is 5447 jobs (1.8 percent of the without fish level).[72]

b. Livestock Feed

Employment declines as a result of the negative impacts in output. From the initial loss of 32 jobs in 1995 employment losses in this sector are projected to increase to 662 jobs by 2020.

c. Recreation Services

Employment losses in the recreation sector are projected to be 55 jobs in 1995, 140 jobs in 2000, and up to 521 jobs by 2020. These can be expresses in relative terms; for example, the employment losses in 2000 amount to 0.0052 percent of the without fish employment.

d. Coal and Gas Effects

Employment is projected to increase in the petroleum and gas production sector and the non-petroleum mining sector as a result of the fuel substitution required to offset the loss of production in hydroelectric generation. The increase in the non-petroleum mining sector is 27 jobs in 1995 and this level increases to approximately 200 jobs by 2020.

e. Construction Effects

Employment increases in the two sectors (construction and combined manufacturing) that comprise the capacity expansion in thermal generation are 155 jobs in 1995 (Table II-12-9) and these increase to 1,025 by 2020. Relative to the without fish scenario, the 1995 employment impacts constitute 0.001 percent of the without fish employment.

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[72] It is worth repeating an earlier caution at this point. The projections to the year 2020 are meant to provide a guide to the future impacts of the with fish scenario. Because these projections assume that the technical relations (production processes) in the economy are static, future impacts will be overstated and this bias increases as the time period is extended. The technique used in this study is superior to straight line projections since it allows the direct impact scenario to change over time.

E. Earnings Impacts

1. Total Earnings Impacts

Levels of earnings are reported for the without fish scenario (see Table II-12-11) and for the with fish scenario (Table II-12-12). Earnings in the Basin are projected to increase as a result of the direct impacts reported above. The aggregate earnings in the Basin economy increases by a projected $844.1 million over the study period (Table II-12-14). The present value of this impact on the economy is $430.5 million at a 3 percent discount rate. The time path of these earnings gains is of interest. The increase for 1995 is $5.9 million, but this increase grows until it reaches $68.4 million by the year 2020 (Table II-12-13).

2. Sectoral Impacts

a. Other Crops

The output in the sector is projected to be higher under the with fish scenario than under the without fish scenario. As expected, earnings are also projected to incur a positive impact. In Table II-12-14 the total increase in earnings over the entire study period total $296.2 million and have a present value (at a 3 percent discount rate) of $144.3 million. The earnings increases grow over time; $0.9 million in 1995, $6.8 million in 2005, and $28.7 million is 2020.

b. Livestock Feed

This sector is projected to incur a negative impact in total output and this trend is matched by a reduction in the total earnings bill or labor earnings of $27.3 million relative to the without fish level over the whole of the study period (Table II-12-14). By 2020 the earnings are $2.4 million below the without fish projection.

c. Recreation Services

Earnings losses are relatively smaller than the employment losses befitting a low earnings sector. Earnings in the with fish scenario are $0.7 million lower than in the without fish scenario in 1995. By 2020 the difference is projected to be $6.5 million (0.016 percent of the without fish level of earnings). Over the entire study period the earnings losses in the recreation services sector sum to $94.1 million (at a 3 percent discount rate the present value of the losses is $48.9 million [Table II-12-14]).

d. Coal and Gas

The total increase over the without fish scenario in earnings in the petroleum and gas sector is $16.9 million (the present value of this is $8.4 million at a 3 percent discount rate).

e. Electric Power

The earnings losses are projected to be $0.5 million in 1995 and $1.0 million in 2000. The relative losses in 2000 represent 0.0030 percent of the total earnings in the without fish scenario.

Table II-12-11. Colorado River Basin: Earnings - Without Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	735.7	725.5	710.9	685.0	662.2	631.5	591.7
Other Crops	1917.2	1903.4	1863.2	1802.6	1747.7	1666.5	1561.5
Livestock Feed	153.2	152.6	148.6	144.3	139.5	133.1	124.7
Misc. Agriculture	2650.7	2865.6	3094.8	3339.3	3503.6	3619.2	3705.3
Non-petroleum Mines	4115.7	4070.1	4071.7	4023.7	3955.8	3856.9	3667.9
Petroleum & Gas Production	2158.9	2071.6	2037.5	2000.1	1964.4	1919.4	1864.1
New Construction	32231.7	34545.9	36888.1	38448.5	39375.1	39993.3	40329.2
Combined Manufacturing	75126.4	79100.6	81623.9	83003.3	83609.3	83408.6	82599.5
Food Products	6797.5	6934.8	7010.4	7063.0	7053.8	7028.4	6976.4
Wood Products	8693.7	9507.4	10018.9	10347.5	10521.3	10527.6	10545.5
Petroleum & Coal Products	1876.8	1859.1	1865.1	1860.0	1857.1	1827.5	1805.8
Transp, Comm, & Utilities	20327.0	21930.8	23343.1	24087.8	24677.9	25109.8	25285.6
Recreation Services	27842.3	30821.4	33626.2	36154.9	37868.6	39072.9	39924.6
Electric Power Production	2492.0	2725.2	2911.4	3017.6	3078.6	3106.0	3070.9
Wholesale/Retail Trade	28929.6	31738.7	34420.6	36248.4	37332.2	38075.1	38063.7
Finance, Insurance, Real Estate	26140.0	28544.9	30628.7	32086.6	33062.0	33558.0	33568.0
Household and Business Services	43344.4	47319.1	51270.2	54054.2	55832.6	57557.8	59307.6
Local Amusements	7308.8	7988.5	8579.7	9000.1	9252.1	9436.2	9457.0
Health, Education, Social Services	37427.3	41432.1	45285.2	48047.6	49633.2	50377.7	50528.8
Government Industries	74577.8	79276.2	82447.2	84343.5	86873.8	88611.3	90472.1
TOTAL	404846.8	435513.6	461845.5	479758.0	492000.7	499516.7	503450.0

Table II-12-12. Colorado River Basin: Earnings - With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	735.7	725.5	710.9	685.0	662.2	631.4	591.6
Other Crops	1917.2	1904.3	1866.0	1809.3	1759.7	1686.0	1590.3
Livestock Feed	153.2	152.5	148.3	143.6	138.4	131.4	122.3
Misc. Agriculture	2650.7	2865.7	3095.3	3340.4	3505.6	3622.5	3710.4
Non-petroleum Mines	4115.7	4071.0	4073.9	4027.5	3960.9	3862.6	3674.8
Petroleum & Gas Production	2158.9	2071.7	2037.6	2000.5	1965.0	1920.6	1865.5
New Construction	32231.7	34548.0	36892.4	38455.1	39384.1	40004.7	40343.1
Combined Manufacturing	75126.4	79103.1	81629.0	83011.2	83619.9	83422.1	82615.9
Food Products	6797.5	6934.8	7010.3	7062.9	7053.6	7028.2	6976.1
Wood Products	8693.7	9507.5	10019.1	10347.8	10521.9	10528.4	10546.7
Petroleum & Coal Products	1876.8	1859.1	1865.1	1860.0	1857.1	1827.6	1805.9
Transp, Comm, & Utilities	20327.0	21930.8	23343.2	24087.8	24678.1	25110.0	25286.4
Recreation Services	27842.3	30820.7	33624.4	36152.0	37864.5	39067.5	39918.1
Electric Power Production	2492.0	2724.8	2910.3	3015.6	3075.9	3102.1	3067.1
Wholesale/Retail Trade	28929.6	31738.8	34420.9	36248.8	37332.8	38075.9	38064.7
Finance, Insurance, Real Estate	26140.0	28545.0	30628.8	32087.0	33062.7	33559.2	33569.9
Household and Business Services	43344.4	47319.5	51271.0	54055.5	55834.4	57560.3	59311.0
Local Amusements	7308.8	7988.5	8579.7	9000.1	9252.1	9436.2	9457.0
Health, Education, Social Services	37427.3	41432.1	45285.3	48047.7	49633.2	50377.8	50528.9
Government Industries	74577.8	79276.2	82447.3	84343.6	86874.0	88611.6	90472.6
TOTAL	404846.8	435519.5	461858.7	479781.2	492036.1	499566.2	503518.4

Table II-12-13. Colorado River Basin: Earnings - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Other Crops	0.0	0.9	2.7	6.8	12.0	19.5	28.7
Livestock Feed	0.0	-0.1	-0.3	-0.7	-1.1	-1.7	-2.4
Misc. Agriculture	0.0	0.1	0.4	1.1	2.0	3.4	5.1
Non-petroleum Mines	0.0	0.9	2.2	3.8	5.1	5.7	6.9
Petroleum & Gas Production	0.0	0.1	0.2	0.4	0.6	1.2	1.4
New Construction	0.0	2.1	4.3	6.6	9.0	11.4	13.9
Combined Manufacturing	0.0	2.5	5.1	7.9	10.7	13.5	16.4
Food Products	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3
Wood Products	0.0	0.1	0.2	0.3	0.5	0.8	1.1
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.2	0.3	0.8
Recreation Services	0.0	-0.7	-1.8	-2.9	-4.1	-5.3	-6.5
Electric Power Production	0.0	-0.5	-1.0	-2.1	-2.7	-3.9	-3.8
Wholesale/Retail Trade	0.0	0.1	0.3	0.4	0.6	0.8	1.1
Finance, Insurance, Real Estate	0.0	0.1	0.2	0.4	0.7	1.2	1.8
Household and Business Services	0.0	0.4	0.7	1.2	1.8	2.5	3.4
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Government Industries	0.0	0.0	0.1	0.1	0.2	0.3	0.5
TOTAL	0.0	5.9	13.2	23.2	35.3	49.5	68.4

Table II-12-14. Colorado River Basin: Earnings - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-0.9	-0.5	-0.3	-0.1
Other Crops		296.2	144.3	92.2	33.6
Livestock Feed		-27.3	-13.6	-8.8	-3.4
Misc. Agriculture		50.5	24.5	15.5	5.6
Non-petroleum Mines		109.9	58.0	39.2	16.6
Petroleum & Gas Production		16.9	8.4	5.5	2.1
New Construction		209.4	110.5	74.9	32.1
Combined Manufacturing		248.7	131.4	89.1	38.3
Food Products		-3.7	-2.0	-1.3	-0.6
Wood Products		13.3	6.7	4.4	1.7
Petroleum & Coal Products		0.2	0.0	0.0	-0.1
Transp, Comm, & Utilities		4.9	2.2	1.4	0.4
Recreation Services		-94.1	-48.9	-32.8	-13.6
Electric Power Production		-62.2	-32.4	-21.7	-9.0
Wholesale/Retail Trade		14.3	7.4	5.0	2.1
Finance, Insurance, Real Estate		18.4	9.0	5.7	2.1
Household and Business Services		43.8	22.5	15.0	6.2
Local Amusements		0.7	0.3	0.2	0.1
Health, Education, Social Services		0.7	0.4	0.2	0.1
Government Industries		4.6	2.3	1.5	0.6
TOTAL		844.1	430.5	284.9	114.9

f. Construction

Earnings are projected to increase in both the construction and the combined manufacturing sectors as a result of the output increases required to meet the projected capacity additions in the thermal power sector. The increase in earnings over the without fish are projected to grow over time. In 2000 the earnings in the construction sector are $4.3 million above the levels in the without fish scenario. The accumulated positive impact in the earnings amount to $209.4 million in the construction sector and $248.7 million in the combined manufacturing sector.

F. Fiscal Effects[73]

1. Total Fiscal Effects

Both personal income taxes and indirect business taxes are projected to be higher under the with fish scenario than those under the without fish scenario (see Tables II-12-17 and II-12-21).[74] Revenues from indirect business taxes are projected to be $0.3 million higher in 1995. Personal income tax revenues are projected to increase by $1.5 million in 1995. The total fiscal impact is $1.8 million in this initial year of the fish impacts. By 2020 the fiscal impact is projected to total $23.1 million. The cumulative fiscal impacts are $273.9 million (Tables II-12-18 and II-12-22).

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[73] As in all of these discussions, the fiscal impacts are predicated on the tax structure remaining constant during the study period.

[74] The levels of the indirect business tax for the without fish and with fish projections are reported in Tables II-12-15 and II-12-16. For the personal income tax, Tables II-12-19 and II-12-20.

Table II-12-15. Colorado River Basin: Indirect Business Tax - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	218.2	215.2	210.8	203.2	196.4	187.3	175.5
Other Crops	184.4	183.1	179.2	173.4	168.1	160.3	150.2
Livestock Feed	87.8	87.4	85.2	82.7	80.0	76.3	71.5
Misc. Agriculture	162.5	175.7	189.7	204.7	214.8	221.9	227.2
Non-petroleum Mines	636.0	629.0	629.2	621.8	611.3	596.0	566.8
Petroleum & Gas Production	3460.9	3320.9	3266.1	3206.2	3148.9	3076.8	2988.2
New Construction	1024.3	1097.9	1172.3	1221.9	1251.3	1271.0	1281.7
Combined Manufacturing	2409.9	2537.4	2618.3	2662.6	2682.0	2675.6	2649.6
Food Products	1535.9	1567.0	1584.0	1595.9	1593.9	1588.1	1576.4
Wood Products	353.2	386.2	407.0	420.4	427.4	427.7	428.4
Petroleum & Coal Products	1206.3	1194.9	1198.8	1195.5	1193.6	1174.6	1160.7
Transp, Comm, & Utilities	2948.3	3180.9	3385.7	3493.7	3579.3	3642.0	3667.5
Recreation Services	4307.7	4768.6	5202.6	5593.8	5858.9	6045.3	6177.1
Electric Power Production	789.4	863.3	922.2	955.9	975.2	983.9	972.8
Wholesale/Retail Trade	9239.9	10137.1	10993.6	11577.4	11923.6	12160.8	12157.2
Finance, Insurance, Real Estate	23250.0	25389.0	27242.4	28539.1	29406.7	29847.8	29856.8
Household and Business Services	1292.8	1411.4	1529.2	1612.2	1665.3	1716.7	1768.9
Local Amusements	920.4	1006.0	1080.4	1133.3	1165.1	1188.3	1190.9
Health, Education, Social Services	187.7	207.8	227.1	240.9	248.9	252.6	253.4
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	54215.6	58358.7	62124.1	64734.9	66390.9	67293.1	67320.6

Table II-12-16. Colorado River Basin: Indirect Business Tax - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	218.2	215.2	210.8	203.2	196.4	187.3	175.5
Other Crops	184.4	183.2	179.5	174.1	169.3	162.2	153.0
Livestock Feed	87.8	87.4	85.0	82.3	79.3	75.3	70.1
Misc. Agriculture	162.5	175.7	189.8	204.8	214.9	222.1	227.5
Non-petroleum Mines	636.0	629.1	629.6	622.4	612.1	596.9	567.9
Petroleum & Gas Production	3460.9	3321.1	3266.4	3206.9	3149.9	3078.8	2990.4
New Construction	1024.3	1097.9	1172.4	1222.1	1251.6	1271.4	1282.1
Combined Manufacturing	2409.9	2537.5	2618.5	2662.8	2682.4	2676.0	2650.2
Food Products	1535.9	1567.0	1584.0	1595.9	1593.8	1588.1	1576.3
Wood Products	353.2	386.3	407.0	420.4	427.5	427.7	428.5
Petroleum & Coal Products	1206.3	1194.9	1198.8	1195.5	1193.6	1174.7	1160.7
Transp, Comm, & Utilities	2948.3	3180.9	3385.7	3493.7	3579.4	3642.0	3667.6
Recreation Services	4307.7	4768.5	5202.3	5593.4	5858.3	6044.4	6176.0
Electric Power Production	789.4	863.1	921.9	955.2	974.4	982.7	971.6
Wholesale/Retail Trade	9239.9	10137.1	10993.7	11577.5	11923.8	12161.1	12157.5
Finance, Insurance, Real Estate	23250.0	25389.1	27242.5	28539.5	29407.4	29848.9	29858.4
Household and Business Services	1292.8	1411.4	1529.2	1612.3	1665.3	1716.8	1769.0
Local Amusements	920.4	1006.0	1080.4	1133.3	1165.1	1188.3	1190.9
Health, Education, Social Services	187.7	207.8	227.1	240.9	248.9	252.6	253.4
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	54215.6	58359.0	62124.8	64736.3	66393.3	67297.2	67326.6

Table II-12-17. Colorado River Basin: Indirect Business Tax - Difference Between Without Fish and With Fish Impacts
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.1	0.3	0.6	1.2	1.9	2.8
Livestock Feed	0.0	-0.1	-0.2	-0.4	-0.7	-1.0	-1.4
Misc. Agriculture	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Non-petroleum Mines	0.0	0.1	0.3	0.6	0.8	0.9	1.1
Petroleum & Gas Production	0.0	0.2	0.3	0.7	1.0	1.9	2.2
New Construction	0.0	0.1	0.1	0.2	0.3	0.4	0.4
Combined Manufacturing	0.0	0.1	0.2	0.3	0.3	0.4	0.5
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Recreation Services	0.0	-0.1	-0.3	-0.5	-0.6	-0.8	-1.0
Electric Power Production	0.0	-0.2	-0.3	-0.7	-0.8	-1.2	-1.2
Wholesale/Retail Trade	0.0	0.0	0.1	0.1	0.2	0.3	0.3
Finance, Insurance, Real Estate	0.0	0.1	0.1	0.4	0.6	1.1	1.6
Household and Business Services	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.3	0.7	1.4	2.4	4.1	6.0

Table II-12-18. Colorado River Basin: Indirect Business Tax - Present Values of Differences by Sector
(Listing and Critical Habitat)
(1982$ Millions)

Direct and Indirect Impacts

INDUSTRIAL SECTORS	Discount Rates	0.00	0.03	0.05	0.10
Livestock		-0.3	-0.1	-0.1	0.0
Other Crops		28.5	13.9	8.9	3.2
Livestock Feed		-15.7	-7.8	-5.1	-1.9
Misc. Agriculture		3.1	1.5	1.0	0.3
Non-petroleum Mines		17.0	9.0	6.1	2.6
Petroleum & Gas Production		27.0	13.5	8.8	3.4
New Construction		6.7	3.5	2.4	1.0
Combined Manufacturing		8.0	4.2	2.9	1.2
Food Products		-0.8	-0.4	-0.3	-0.1
Wood Products		0.5	0.3	0.2	0.1
Petroleum & Coal Products		0.1	0.0	0.0	0.0
Transp, Comm, & Utilities		0.7	0.3	0.2	0.1
Recreation Services		-14.6	-7.6	-5.1	-2.1
Electric Power Production		-19.7	-10.3	-6.9	-2.9
Wholesale/Retail Trade		4.6	2.4	1.6	0.7
Finance, Insurance, Real Estate		16.4	8.0	5.1	1.9
Household and Business Services		1.3	0.7	0.4	0.2
Local Amusements		0.1	0.0	0.0	0.0
Health, Education, Social Services		0.0	0.0	0.0	0.0
Government Industries		0.0	0.0	0.0	0.0
TOTAL		62.9	31.0	20.0	7.6

Table II-12-19. Colorado River Basin: Personal Income Tax - Without Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	183.9	181.4	177.7	171.3	165.6	157.9	147.9
Other Crops	479.3	475.8	465.8	450.6	436.9	416.6	390.4
Livestock Feed	38.3	38.1	37.2	36.1	34.9	33.3	31.2
Misc. Agriculture	662.7	716.4	773.7	834.8	875.9	904.8	926.3
Non-petroleum Mines	1028.9	1017.5	1017.9	1005.9	988.9	964.2	917.0
Petroleum & Gas Production	539.7	517.9	509.4	500.0	491.1	479.8	466.0
New Construction	8057.9	8636.5	9222.0	9612.1	9843.8	9998.3	10082.3
Combined Manufacturing	18781.6	19775.1	20406.0	20750.8	20902.3	20852.2	20649.9
Food Products	1699.4	1733.7	1752.6	1765.7	1763.4	1757.1	1744.1
Wood Products	2173.4	2376.8	2504.7	2586.9	2630.3	2631.9	2636.4
Petroleum & Coal Products	469.2	464.8	466.3	465.0	464.3	456.9	451.4
Transp, Comm, & Utilities	5081.7	5482.7	5835.8	6021.9	6169.5	6277.4	6321.4
Recreation Services	6960.6	7705.4	8406.5	9038.7	9467.2	9768.2	9981.2
Electric Power Production	623.0	681.3	727.8	754.4	769.6	776.5	767.7
Wholesale/Retail Trade	7232.4	7934.7	8605.2	9062.1	9333.0	9518.8	9515.9
Finance, Insurance, Real Estate	6535.0	7136.2	7657.2	8021.7	8265.5	8389.5	8392.0
Household and Business Services	10836.1	11829.8	12817.6	13513.6	13958.2	14389.5	14826.9
Local Amusements	1827.2	1997.1	2144.9	2250.0	2313.0	2359.1	2364.2
Health, Education, Social Services	9356.8	10358.0	11321.3	12011.9	12408.3	12594.4	12632.2
Government Industries	18644.4	19819.0	20611.8	21085.9	21718.5	22152.8	22618.0
TOTAL	101211.7	108878.4	115461.4	119939.5	123000.2	124879.2	125862.5

Table II-12-20. Colorado River Basin: Personal Income Tax - With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

				Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	183.9	181.4	177.7	171.2	165.5	157.8	147.8
Other Crops	479.3	475.8	465.7	450.5	436.7	416.3	390.0
Livestock Feed	38.3	38.1	37.0	35.8	34.5	32.6	30.2
Misc. Agriculture	662.7	716.4	773.7	834.7	875.7	904.6	926.0
Non-petroleum Mines	1028.9	1017.8	1018.5	1006.9	990.2	965.6	918.7
Petroleum & Gas Production	539.7	517.9	509.4	500.1	491.2	480.1	466.3
New Construction	8057.9	8638.3	9224.4	9614.4	9846.2	10001.4	10088.7
Combined Manufacturing	18781.6	19777.3	20408.7	20753.3	20904.9	20855.4	20656.7
Food Products	1699.4	1733.7	1752.6	1765.7	1763.4	1757.0	1744.0
Wood Products	2173.4	2376.9	2504.8	2586.9	2630.4	2631.9	2636.5
Petroleum & Coal Products	469.2	464.8	466.3	465.0	464.2	456.8	451.3
Transp, Comm, & Utilities	5081.7	5482.8	5835.8	6021.8	6169.2	6277.0	6321.0
Recreation Services	6960.6	7705.1	8405.8	9037.4	9465.3	9765.8	9978.4
Electric Power Production	623.0	681.2	727.6	753.9	768.9	775.4	766.7
Wholesale/Retail Trade	7232.4	7934.8	8605.3	9062.2	9333.1	9518.9	9516.1
Finance, Insurance, Real Estate	6535.0	7136.2	7657.1	8021.5	8265.2	8389.1	8391.5
Household and Business Services	10836.1	11830.1	12817.9	13513.7	13958.2	14389.5	14827.4
Local Amusements	1827.2	1997.1	2144.9	2250.0	2313.0	2359.0	2364.2
Health, Education, Social Services	9356.8	10358.0	11321.3	12011.9	12408.3	12594.4	12632.2
Government Industries	18644.4	19819.1	20611.8	21085.9	21718.4	22152.7	22618.0
TOTAL	101211.7	108882.8	115466.2	119942.8	123002.4	124881.3	125871.5

Table II-12-21. Colorado River Basin: Personal Income Tax - Difference Between Without Fish and With Fish Impacts (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.2	0.7	1.7	3.0	4.9	7.2
Livestock Feed	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.6
Misc. Agriculture	0.0	0.0	0.1	0.3	0.5	0.8	1.3
Non-petroleum Mines	0.0	0.2	0.5	1.0	1.3	1.4	1.7
Petroleum & Gas Production	0.0	0.0	0.0	0.1	0.2	0.3	0.3
New Construction	0.0	0.5	1.1	1.6	2.2	2.8	3.5
Combined Manufacturing	0.0	0.6	1.3	2.0	2.7	3.4	4.1
Food Products	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Wood Products	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Recreation Services	0.0	-0.2	-0.4	-0.7	-1.0	-1.3	-1.6
Electric Power Production	0.0	-0.1	-0.3	-0.5	-0.7	-1.0	-0.9
Wholesale/Retail Trade	0.0	0.0	0.1	0.1	0.2	0.2	0.3
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.1	0.2	0.3	0.5
Household and Business Services	0.0	0.1	0.2	0.3	0.5	0.6	0.9
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.1	0.1
TOTAL	0.0	1.5	3.3	5.8	8.8	12.4	17.1

Table II-12-22. Colorado River Basin: Personal Income Tax - Present Values of Differences by Sector (Listing and Critical Habitat) (1982$ Millions)

INDUSTRIAL SECTORS	Discount Rates	Direct and Indirect Impacts 0.00	0.03	0.05	0.10
Livestock		-0.2	-0.1	-0.1	0.0
Other Crops		74.0	36.1	23.1	8.4
Livestock Feed		-6.8	-3.4	-2.2	-0.8
Misc. Agriculture		12.6	6.1	3.9	1.4
Non-petroleum Mines		27.5	14.5	9.8	4.2
Petroleum & Gas Production		4.2	2.1	1.4	0.5
New Construction		52.3	27.6	18.7	8.0
Combined Manufacturing		62.2	32.8	22.3	9.6
Food Products		-0.9	-0.5	-0.3	-0.1
Wood Products		3.3	1.7	1.1	0.4
Petroleum & Coal Products		0.0	0.0	0.0	0.0
Transp, Comm, & Utilities		1.2	0.6	0.3	0.1
Recreation Services		-23.5	-12.2	-8.2	-3.4
Electric Power Production		-15.6	-8.1	-5.4	-2.3
Wholesale/Retail Trade		3.6	1.9	1.2	0.5
Finance, Insurance, Real Estate		4.6	2.2	1.4	0.5
Household and Business Services		10.9	5.6	3.[illegible]	1.5
Local Amusements		0.2	0.1	0.0	0.0
Health, Education, Social Services		0.2	0.1	0.1	0.0
Government Industries		1.2	0.6	0.4	0.1
TOTAL		211.0	107.6	71.2	28.7

**Table II-12-23. Colorado River Basin: Present Value Deviations from Without Fish Impacts
(Listing and Critical Habitat)
(Percentage Change)**

Total Effects

Discount Rates	0.00	0.03	0.05	0.10
Output	0.0060	0.0048	0.0041	0.0027
Earnings	-0.0026	-0.0020	-0.0017	-0.0011
Indirect Business Taxes	-0.0043	-0.0034	-0.0029	-0.0019
Personal Income Taxes	-0.0026	-0.0020	-0.0017	-0.0011

G. Total Cumulative Deviations

Table II-12-23 reports the cumulative deviations from the without fish scenario due to the with fish impacts. These values are calculated for each of the four macroeconomic aggregates. For aggregate output the present value of the cumulative deviations is 0.0048 of the without fish scenario. That is, the present value of the stream of output is 0.0048 percent higher in the with fish than the without fish scenario.

H. Comparison of Basin-Wide Impacts and State Level Impacts

Adding up the aggregate impacts (at the 3 percent discount rate) across the State-level models yields a total impact of $1209.8 million increase in the total output across all sectors. The Colorado Basin I-O model (covering all seven States) yields $1390.7 million for the increase in total output across all sectors. The difference in the reported outcomes between the sum of the individual State results and the results generated by the Colorado River Basin regional model is due to the fact that direct impacts in a given State actually generate indirect effects elsewhere in the national economy. The larger region (Colorado River Basin region) captures more of these effects than a single State (even one as large and diverse as California) is able to do.

Comparing the results from the State-level models to the region-wide model shows that there are gainers and losers across States as well as across sectors. For some States (Wyoming, New Mexico, and Colorado), the agriculture sectors experience negative impacts in output.

The California results suggest that these same sectors experience a positive impact in this State. By analyzing the region as a whole, the net effect is apparent. This net effect is positive for the other crops sector and negative for the livestock feed sector. Total output across the agriculture sectors increases, indicating that the value of the lost output in the livestock sector is more than offset by the value of the increased output in the other crops sector.

The overall results suggest that the aggregate effects of introducing measures to preserve and recover the endangered species will be positive; output will increase. However, there will be distributional consequences as the negative impacts will be borne by some sectors and some States while the positive impacts will be reaped by other States and sectors. On balance, the regional economy would expand under the actions proposed to preserve and recover the fishes.

Volume II

Chapter 13: National Economic Impacts — Computable General Equilibrium Model Results

A. Introduction - Measuring National Economic Efficiency Effects

Actions taken to preserve and recover the endangered fishes may result in the re-allocation of resources within the regional and the national economy. Evaluating the economic impacts of these changes requires comparing the levels of economic activity before and after the reallocation of resources. An implicit assumption underlying such comparisons is that the resource use in the without fish scenario represents the highest valued use of the resources and that the economy returns to a new equilibrium after the initial direct impacts of the re-allocation have worked through the economy.[75] The post-impact allocation of resources is a new highest valued use of the resources.

These assumptions allow the comparison of the total value of the output of the economy before the re-allocation to the total value of the output after the re-allocation. The difference is the measure of the national economic costs or benefits of the direct impacts or resource re-allocation being evaluated.[76] [77] These costs or benefits are sometimes referred to as efficiency costs or benefits. Economic theory prescribes that national efficiency impacts be measured as changes in the consumer and producer surplus. These measures capture the net social gains and losses resulting from the resource reallocation.

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[75] The highest valued use is conditional on the existing system of property rights, current technology, and current distribution of income. The importance of this set of initial conditions will become apparent in the following discussion.

[76] The appropriate measure of the cost of resources is their opportunity cost. This is the value of what these resources are capable of producing in their next best use.

[77] It is possible that the direct impacts do generate benefits although the initial allocation of resources was according to their highest valued use. Direct impacts may be associated with changes in technology or in the assignment of property rights that permit more efficient allocation of resources. A good example is provided by free trade among nations where there was formerly a set of restrictions on this trade.

In practice it is rarely feasible to compute all changes in economic (consumer and producer) surplus. This chapter discusses the computation of the national economic impacts of actions taken on behalf of the endangered fishes through a series of analytical steps involving increasing adherence to economic theory. In the first step (section B below), the traditional method of addressing impacts across multiple sectors is discussed. The second step presents the results obtained from the use of a computable equilibrium model (CGE) to analyze the national economic impacts associated with actions undertaken for listing and the proposed critical habitat. This step (see sections D and E below) relies on conventional measures of economic activity and corrects for some of the omissions inherent in the traditional method. The third step (section F) exploits the capability of a CGE model and reports the calculation of changes in consumer and producer surplus that will accompany the reallocation of resources in the with fish scenario.

B. A Traditional Approach For Estimating National Efficiency Effects

Typically, economists have not been able to compute generalized changes in consumer and producer surplus. Thus, approximate approaches have been developed. The marginal direct output changes associated with the resource reallocation is determined. A value is then placed on this direct output change by utilizing market prices. As an example, the production change in the hydroelectric generation sector resulting from alterations in the hydrograph of the river (the resource re-allocation) is determined. The output change times the market price yields an approximation of the foregone power generation. This approach assumes that the value of the direct output given up to undertake the resource reallocation is equal to the cost of the resources necessary to undertake the activities represented by the reallocation. This procedure represents a traditional estimate of national efficiency impacts.[78]

Computing national efficiency costs or benefits in this fashion is an acceptable approximation if several assumptions are satisfied. First, to use market prices to value the resources displaced by the impact requires that the market for the good in question be free of distortions so that the prices truly reflect the opportunity cost of the resources used to produce that good. Second, all other markets in the economy must be operating completely free of distortions. That is, the price paid by consumers must be identical to the cost of producing the good in all markets.[79] Third, the entire national-level impact must be identical with the regional-level impact. That is, resources do not flow across regional boundaries as a result of the re-allocation of resources.

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[78] When impacts occur in several sectors, the impacts computed in this fashion are added across all directly affected sectors. Impacts calculated in this way are measured as changes in output in the affected sectors.

With these assumptions in mind, an estimate of the national efficiency benefits of the impacts due to the listing and the designation of proposed critical habitat can be arrived at by determining the value of the direct impacts for various years through the study period (see Table II-13-1). For the regional economy, this measure would yield a value of $12.24 million for the benefits associated with the species listing and proposed critical habitat actions in 1995. Similarly, the value for the year 2010 is $32.83 million.[80]

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[79] An alternative to this assumption is the assumption that the economic consequences of the listing and proposed critical habitat designation are confined to the markets in which the direct impacts occur. That is, there are no indirect effects that are felt in related markets.

[80] Annualized and present value estimates of the traditional approach are presented for the incremental cost of proposed critical habitat designation in Chapter II-15.

Table II-13-1. Direct Impacts for the Colorado River Basin
(Listing and Critical Habitat)
(1982$ Millions)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	-3.053	-6.167	-11.340	-13.559	-18.109	-23.359
Other Crops	5.925	12.358	27.378	36.532	53.144	69.629
Recreation	-2.558	-3.686	-3.936	-4.186	-4.436	-4.686
Electric Power	-3.958	-4.120	-8.177	-4.668	-9.664	-0.437
Non-petroleum Mining	2.409	3.394	4.555	3.515	2.130	3.711
Oil and Gas Mining	1.608	1.147	3.463	2.500	8.063	1.680
Construction	6.350	6.350	6.350	6.350	6.350	6.350
Combined Manufacturing	6.350	6.350	6.350	6.350	6.350	6.350
TOTAL DIRECT IMPACTS	12.238	15.626	24.643	32.834	43.828	59.238

For the purposes of the current analysis of the endangered fishes, assumptions 2 and 3 discussed above are arguably not fulfilled.[81] For instance, Assumption 2 relates to the fact that in an integrated economy all markets are more or less interdependent. An exogenous impact in one market will cause responses in other markets through changes in relative prices of the outputs of these markets. If all of the indirectly affected markets in the economy are free of distortions, then reallocating resources among these markets would generate a series of offsetting effects.[82]

An illustration of why markets are not free of distortions can be found in the use of indirect business taxes that drive a wedge between the price paid by consumers and the cost of producing the good. If these markets are not free of distortions, then an accounting of the economic efficiency impacts of listing and the designation of proposed critical habitat requires a framework that captures the net effects of changes in consumer and producer surplus.

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[81] There is also some question concerning assumption 1 in the sense that all sectors have some form of excise taxation.

[82] These responses should not be confused with "distributional" effects. They are responses of surplus in interconnected markets.

Although the region comprised of the seven States within the Colorado River Basin represents a very extensive economy, there are considerable flows of goods and services between this region and the rest of the U.S. (as well as the rest of the world). The third assumption is thus also violated for the Colorado River Basin region since there is considerable movement of goods across the boundaries of this region. Thus, it is likely that the impacts reported in Table II-13-1 spill over regional boundaries and affect the economy elsewhere. Again, what is needed is a framework that captures the net effects. This framework can be found in Just, Hueth, and Schmitz (1982); Boadway and Bruce (1984).

C. A Computable General Equilibrium Framework

The CGE model used in this investigation takes explicit account of the exchanges between the region and the remainder of the country and world.[83] As a result, it reports net national economic effects.[84] The CGE model treats the Colorado River Basin region as a small open economy (SOE). The SOE assumptions are that the economy takes world (that is the rest of the U.S. and the world) prices as given and responds through supply and demand adjustments to changes in these world prices.[85] Through this external trade sector, the implications for the national economy relative to the regional economy are accounted for in the results. Thus, the impacts reported by the CGE model are effective measures of net national efficiency effects of the resource reallocation resulting from listing and proposed critical habitat designation.

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[83] For instance, I-O models do not explicitly deal with imports and exports. As a result they address regional impacts, only.

[84] The CGE model constructed to evaluate the impacts of endangered fishes is not dynamic nor are the data available to permit the construction of a growth path similar to that done for the I-O model stages used in Chapters II-11 and II-12. Thus, the analysis is conducted for the first year of direct impacts as presented in Chapters II-9 and II-10.

[85] This SOE structure is widely used to capture the interactions between a country or region that represents a small part of the global economy. De Melo and Tarr (1992) adopt this structure for their trade model of the U.S. economy.

Judgements must be made concerning the extent to which regional impacts are, in fact, national impacts or the extent to which they are pure transfers of resources from elsewhere in the economy. This is particularly important in the case of direct impacts relating to large-scale investment in new facilities. If the construction and capital equipment sectors are operating at capacity, then the newly installed thermal capacity within the Colorado River Basin region will displace capacity expansion activities elsewhere in the U.S. economy. The value of the displaced activities will be very close to the value of the thermal generation plants since these changes occur at the margin. Thus, the net national impact of the thermal capacity addition would have a zero value.[86] At the other extreme, there may be sufficient excess capacity in the construction and capital equipment sectors that the investment in expansion of the thermal capacity is a pure addition to the national economy.[87]

To select the most likely scenario for the future would involve detailed projections for these sectors and such projections are not available. The solution is to construct a set of scenarios that provide boundary estimates of the overall net national economic impacts. These scenarios must be constructed on the basis of accepted economic theory; not merely on the basis of withdrawals of various impacts selected on an ad hoc basis. The sectors identified above are ones in which some degree of substitutability is likely, and represent significant economic activities that may be impacted by listing and designating proposed critical habitat.

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[86] Another sector for which the possibility of offsetting effects outside the region is important is the recreation services sector. If recreation opportunities are reduced within the Colorado River Basin region, it may be that there are substitute activities that will be undertaken outside the region. This is, again, an excess capacity argument. The extent to which recreation substitutes are available depends on the level of excess capacity elsewhere in the economy. If there is sufficient capacity to absorb the displaced activity within the region, then the national impact in the recreation sector has a zero value. On the other hand, if there is no excess capacity, then the regional direct impact is equal to the national direct impact. Scenarios are developed in Chapter II-15 that address alternative assumptions regarding substitutability of recreation services.

[87] From the perspective of the national economy, the hydropower capacity that is lost due to the changes in the hydrographs in the with fish scenario is a sunk cost. The owners of the resources in this sector will experience a loss but not the national economy.

Scenario A1 is based on the assumption is that there is sufficient excess capacity in the construction and capital equipment sectors that the additional capacity in the thermal generation represents a net addition in the output of these sectors for the nation as a whole. In Scenario B1, it is assumed that there is zero excess capacity in the construction and capital equipment sectors. Thus, all additions to thermal generation capacity require the withdrawal of resources from elsewhere and the net result is that the direct impact is zero for the construction and combined manufacturing sectors. Since the true situation most likely lies in between these polar opposites, the bounds on the actual outcome may be arrived at by considering these two extremes. In Chapter II-15, two additional scenarios are investigated in which the recreation direct impacts are also adjusted to reflect the case of no outside substitutes and sufficient outside substitutes.[88]

The data base for the Colorado River Basin region CGE model is the regional data derived from the IMPLAN data bases for the year 1982.[89] Exogenous impacts are applied by scaling the impacts to reflect the level of economic activity present in the initial economy.[90]

As discussed in Chapter II-7 verification of the specification of the CGE model requires that the model reproduce the allocation of resources in the benchmark data set. That allocation is presumed to be the best the economy was capable of with the given technology and the existing assignment of property rights. There is no presumption that this allocation represents the "best of all possible worlds". Thus, it is entirely possible that a different assignment of property rights would increase the level of economic activity and the well-being of the residents.

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[88] One issue not addressed in this report is the role of quality impacts that may accompany the with fish scenario. The data are not currently available which would make it feasible to analyze such potential impacts.

[89] The test of the accuracy of the CGE model is that it reproduces the benchmark data set as the equilibrium of the model.

[90] For the analysis reported in this chapter, the 1995 direct impacts were scaled to reflect the level of economic activity in the 1982 benchmark data set. These direct impacts were introduced as changes in the components of final demand for the various sectors.

Common practice is to report the results in the form of percentage deviations from the initial economy and in terms of levels. In this way, the data are available to be applied to the levels of economic activity that exist or are projected for the time period under consideration. Additionally, the impacts are described in terms of levels, in order to yield values of national efficiency impacts for a given year.

D. CGE Results Based on the Impact Scenario for the Year 1995 - Results Expressed as Deviations from the Benchmark Values

The CGE model reports changes in levels of output by sector, earnings, employment, and real gross regional product (RGRP),[91] and government revenues. In the following sections, these measures are reported as deviations from the without fish scenario. In this analysis, labor supply is free to grow within the region. Economic links with the rest of the U.S. (and the world) take place through imports and exports of goods and services, foreign borrowing (investment), and employment payments from outside. The Armington and CET functions described in Chapter II-8 describe the external linkages that take place through the goods and services markets.

1. Aggregate Changes in National Economic Activity

a. Scenario A1: All Electric Power Capacity Increases Are a Net Addition

The direct impacts for the Colorado River Basin regional economy in 1995 are projected to be positive (see Table II-13-1). The aggregate total percent changes from those of the without fish scenario are reported in Table II-13-2. Regional gross product is projected to increase by 0.014 percent (e.g., fourteen thousandths of a percent) as a result of listing and the designation of proposed critical habitat. Since the national effects are accounted for in the CGE model, this would represent an increase in the national gross product. Employment is projected to increase by 0.021 percent, earnings by 0.026 percent, and government revenues by 0.011 percent. In all cases, these effects would represent national effects when converted to dollar values as described in the previous footnote.

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[91] It is important to note that although the results are reported for the regional economy these results incorporate national impacts resulting from imports, exports, and labor mobility.

b. Scenario B1: All Electric Power Capacity Increases Are a Transfer

In this scenario, the additions to the thermal generation capacity are treated as a transfer from the rest of the national economy. That is, from a national perspective these expenditures are the result of a pure shift of resources from outside the region.

The percentage deviation of the aggregate economic variables for this scenario is also reported in Table II-13-2. Gross regional product is projected to decline from the without fish scenario value by 0.007 percent. Most of the remaining macroeconomic variables are also projected to decline as a result of the effects of listing and the proposed designation of critical habitat. Thus, employment is projected to decline by 0.008 percent, earnings by 0.017 percent, and government revenue by 0.0072 percent.

Table II-13-2. Percent Deviation from Without Fish Scenario for Macroaggregate Impacts: Scenarios A1 and B1
(Listing and Critical Habitat)

	Scenario A1[a]	Scenario B1[b]
Real Gross Regional Product	0.014%	-0.007 %
Employment	0.021%	-0.008 %
Earnings	0.026%	-0.017 %
Total Government Revenues	0.011%	-0.0072%

[a] Scenario A1: There exists sufficient underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) that all additions to thermal electric capacity are a net positive addition to the level of national economic activity. The recreation resources within the Basin are unique and the loss of these recreation opportunities cannot be replaced within the U.S. economy.

[b] Scenario B1: There is no underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) and all additions to thermal electric capacity within the Basin are constructed with resources that must be displaced from elsewhere in the national economy. Thus, there is no net positive impact from this expenditure on thermal expansion. The recreation resources within the Basin are unique and the loss of these recreation opportunities cannot be replaced within the U.S economy.

2. Changes in Output by Sector

a. Scenario A1: All Electric Power Capacity Increases Are a Net Addition

Table II-13-3 summarizes the sectoral results of the CGE evaluation of the impacts due to listing and proposed designation of critical habitat for the scenario in which the additions to thermal capacity are a net addition at the national level. Output is projected to increase in several sectors and decline in only a few. The largest output increases are projected to occur in the other crops sector (0.047 percent) and the construction sector (0.049 percent). The largest percentage declines are projected for the livestock feed sector (-0.037 percent) and the petroleum and coal products sector (-0.022 percent).

b. Scenario B1: All Electric Power Capacity Increases Are a Transfer

Table II-13-3 summarizes the sectoral results for the scenario in which the additions to thermal capacity are a pure transfer. Positive impacts are projected to occur in the livestock sector (0.01 percent), the other crops sector (0.038 percent), and the sectors representing the fuels that serve as a substitute for the reduced hydroelectric generation (non-petroleum mines for coal and petrol/gas mines for natural gas). Food products (-0.025 percent) and electric power (-0.021 percent) record the largest negative impacts.

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Table II-13-3. Percentage Change from Without Fish Scenario By Sector (Listing and Critical Habitat)

Sectors	Output		Employment		Earnings	
	Scenario A1	Scenario B1	Scenario A1	Scenario B1	Scenario A1	Scenario B1
Livestock	0.034	0.010	0.072	0.022	0.078	0.015
Other Crops	0.047	0.038	0.166	0.132	0.171	0.125
Livestock Feed	-0.037	-0.003	-0.710	-0.054	-0.703	-0.052
Misc. Agric.	0.017	0.003	0.069	0.004	0.074	-0.004
Non-petrol. Mines	0.035	0.037	0.044	0.047	0.049	0.039
Petrol/Gas Mines	--	0.002	--	0.015	--	0.024
Construction	0.049	-0.003	0.056	-0.003	0.061	-0.011
Combined Mfg.	0.026	-0.014	0.031	-0.017	0.037	-0.024
Food Prods.	0.022	-0.025	0.035	-0.042	0.040	-0.049
Wood Prods.	0.032	-0.019	0.042	-0.025	0.047	-0.033
Petrol/Coal Prods.	-0.022	-0.006	-0.039	-0.013	-0.034	-0.019
Transp, Comm, Util.	0.029	-0.021	0.050	-0.036	0.055	-0.044
Recreation Serv.	--	-0.010	--	-0.013	-0.004	-0.020
Electric Power	-0.007	-0.021	-0.022	-0.066	-0.017	-0.073
Wholesale/Retail Trade	0.023	-0.015	0.028	-0.018	0.033	-0.026
Finance, Insur. & Real Estate	-0.013	0.009	-0.050	0.041	-0.050	0.033
Household & Bus. Services	0.023	-0.013	0.039	-0.022	0.044	-0.029
Local Amusements	0.023	-0.016	0.034	-0.024	0.039	-0.032
Health, Education, & Public Services	0.009	-0.007	0.009	-0.008	0.015	-0.015

3. Changes in Employment by Sector

a. Scenario A1: All Electric Power Capacity Increases Are a Net Addition

In the CGE model the total labor force is free to adjust in response to market forces. If there is upward pressure on earnings, then the labor force will grow as more persons enter the workforce. For this scenario in which the additions to thermal capacity represent a net addition to the national economy (see Table II-13-3), employment is projected to increase over that of the without fish scenario in nearly all sectors. There are declines in the livestock feed sector (-0.71 percent) and the electric power sectors (-0.022 percent). The other crops sector is projected to have the largest employment growth (0.166 percent). Overall, as the discussion above reported, total employment is projected to increase in the with fish projection.

b. Scenario B1: All Electric Power Capacity Increases Are a Transfer

The employment change figures reported in Table II-13-3 show that the declining sectors outnumber the growing sectors. This trend was reflected in the total employment impacts described above. Employment in the other crops sector is projected to increase by 0.132 percent in the with fish scenario. Increases due to fuel substitution occur in the non-petroleum mining sector (coal production) and in the petrol/gas mining sector (natural gas production). The largest percentage declines in employment are projected for electric power (-0.066 percent) and livestock feed (-0.054 percent).

4. Changes in Factor Earnings by Sector: Labor

a. Scenario A1: All Electric Power Capacity Increases Are a Net Addition

The CGE model reports factors earnings for capital and labor. These are presented in Table II-13-3 as percentage changes from the without fish scenario. The largest decrease in earnings is projected to be in the livestock feed sector (-0.703 percent) while the largest gain is in the other crops sector (0.171 percent). The overall average change in earnings is projected to increase by 0.0026 percent in the with fish scenario.

b. Scenario B1: All Electric Power Capacity Increases Are a Transfer

Earnings are projected to fall in most of the sectors in the with fish scenario. The largest percentage declines are recorded in the livestock feed sector (-0.052 percent) and the electric power sector (-0.073 percent). Earnings are projected to be higher in the with fish scenario in the other crops sector (0.125 percent), the livestock sector (0.015 percent) and the sectors that are projected to expand through fuel substitution (0.039 percent for the increase in coal production and 0.024 percent for the increase in natural gas production).

E. CGE Results Based on the Impact Scenario for the Year 1995 - Results Expressed as Dollar Values Based on the 1982 Benchmark

The without fish economic activity is based on information given in the 1982 data base. That is, all impacts are reported in 1982$ and in terms of 1982 activity levels.[92] Thus, the CGE model for the Colorado River Basin States region was constructed with 1982 as a benchmark. The 1995 impact scenario was converted to the appropriate deviations from the 1982 benchmark data. As above, the results for the polar case scenarios are presented in turn.

1. Aggregate Changes in the National Economic Activity

a. Scenario A1: All Electric Power Capacity Increases Are a Net Addition

Table II-13-4 reports the results of the simulation run for a set of macroeconomic aggregate measures of economic output. The key variable is the RGRP value. In the without fish scenario the value is $484,213.3 (the value in 1982 million dollars and activity levels). The RGRP projected under the equivalent 1995 direct impacts is $484,280.3. Employment is projected to increase by some 3,140 jobs under the with fish scenario, earnings are projected to increase $26.3 million, and total government revenues will increase by $18.2 million.

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[92] As the reader recalls from the discussion in Chapter II-8, the latest year for which a complete data set was available (including the SAM) was 1982.

Table II-13-4. Levels and Deviations from the Without Fish Scenario for Macroeconomic Inputs:
(Listing and Critcal Habitat)
($1982 Millions except employment)

	Without Fish	Scenario A1	Scenario B1	Difference Between Scenario A1 and Without Fish	Difference Between Scenario B1 and Without Fish
Real Gross Required Product	484,213.3	484,280.3	484,177.2	67.0	-36.1
Employment (# jobs)	15,029,220.0	15,032,360.0	15,028,050.0	3140.0	-1170.0
Earnings	288,907.2	288,933.5	288,857.2	26.3	-49.4
Total Government Revenue	166,249.6	166,267.8	166,237.1	18.2	-12.5

b. Scenario B1: All Electric Power Capacity Increases Are a Transfer

Table II-13-4 reports the aggregate impacts of the with fish direct impacts under the assumption that the electric power capacity additions involve a pure transfer of economic activity from elsewhere in the national economy. The RGRP is projected to decline from $484,213.3 million to $484,177.2 million as a result of listing and the designation of proposed critical habitat. Employment is also projected to decline (by 1170 jobs). Earnings decline by $49.4 million and total government revenues decline by approximately $12.5 million.

2. Changes by Sector: Output, Employment, Earnings

a. Scenario A1: All Electric Power Capacity Increases Are a Net Addition

The results presented in Table II-13-5 (levels) and II-13-6 (changes) illustrate the sectoral output effects due to listing and the proposed critical habitat. Output in the other crops sector is projected to increase from $10486.8 million to $10491.9 million. Output increases are also projected for several sectors including the livestock sector, the combined manufacturing sector, and the construction sector. Total employment increases in the with fish scenario. The largest increases are recorded in the other crops sector (505 jobs), the combined manufacturing sector (579 jobs), the wholesale and retail trade sector (627 jobs), and the construction sector (424 jobs). Earnings changes mimic the employment changes. In the construction sector earnings are projected to increase by $14.47 million and in the other crops sector the earnings increase is projected to be $2.68 million.

b. Scenario B1: All Electric Power Capacity Addition Is a Transfer

Tables II-13-5 and II-13-6 illustrate the sectoral output impacts due to listing and the designation of proposed critical habitat. Output is projected to increase in the with fish scenario in the other crops sector, the livestock sector, and in the sectors responsible for the substitute fuels for thermal electric power production. In general, output declines in the remaining sectors. Total employment declines in this case for the with fish scenario. The number of jobs actually increase in a few sectors such as livestock, other crops, and non-petroleum mines. However, there are declines in the electric power sector (44 jobs), the combined manufacturing sector (312 jobs), and the recreation services sector (187 jobs). Earnings are projected to be lower in most sectors under Scenario B1. The largest declines are in the combined manufacturing sectors ($-12.61 million), the transportation, communications, and utility sector (-$6.11 million), and in the wholesale and retail trade sector (-$5.08 million). However, there are positive impacts in the other crops sector ($1.95 million) and the finance, insurance, and real estate sector ($6.15 million).

Table II-13-5. Levels By Sector for Without Scenario and for With Scenarios A1 and B1 (Listing and Critical Habitat) ($1982 millions except employment)

	Without Fish			Scenario A1			Scenario B1		
	Output	Employment	Earnings	Output	Employment	Earnings	Output	Employment	Earnings
Livestock	9620.99	107114.	581.93	9624.29	107191.	582.38	9621.98	107138.	582.01
Other Crops	10486.85	304083.	1557.32	10491.92	304589.	1599.99	10490.88	304486.	1559.27
Livestock Feed	3656.89	34933.	123.10	3655.52	34685.	122.24	3656.78	34914.	123.02
Misc. Agriculture	5762.05	260513.	1983.39	5765.07	260693.	1984.86	5762.19	260523.	1983.31
Non-petroleum Mines	8135.78	89359.	2939.26	8138.60	89398.	2940.69	8138.80	89401.	2940.40
Petroleum & Gas Production	24720.11	39105.	1742.85	24720.17	39105.	1742.97	24720.65	39111.	1742.99
New Construction	71712.79	760158.	23707.17	71748.06	760582.	23721.64	71710.64	760133.	23704.57
Combined Manufacturing	160339.21	1842576.	51443.78	160380.46	1843155.	51462.64	160317.03	1842264.	51431.17
Food Products	37737.03	213384.	5258.40	37745.18	213458.	5260.52	37727.48	213294.	5255.81
Wood Products	22336.92	306848.	6304.56	22344.10	306976.	6307.53	22332.57	306770.	6302.49
Petroleum & Coal Products	31973.62	22792.	1284.74	31966.68	22783.	1284.30	31971.58	22789.	1284.49
Transportation/Comm. & Utilities	44817.38	522517.	14012.07	44830.32	522779.	14019.82	44808.08	522329.	14005.96
Recreation Services	65229.20	1497289.	18740.44	65228.77	1497276.	18741.26	65222.94	1497102.	18736.69
Electric Power Production	13361.58	66957.	1739.45	13360.63	66943.	1739.16	13358.78	66914.	1738.18
Wholesale/Retail Trade	42917.63	2218631.	19792.32	42927.39	2219258.	19798.95	42911.40	2218231.	19787.24
Finance, Insurance, Real Estate	132708.08	909434.	18462.51	132691.31	908929.	18453.23	132720.44	909806.	18468.66
Household and Business Services	76277.02	1422739.	29930.76	76294.84	1423287.	29943.85	76267.04	1422433.	29922.04
Local Amusements	16580.59	272869.	4949.46	16584.39	272961.	4951.39	16577.90	272804.	4947.90
Health, Education Social Services	117585.92	4137916.	84353.71	117596.42	4138309.	84366.12	117577.61	4137606.	84340.98
TOTALS	895959.59	15029220.	288907.20	896094.13	15032360.	288933.50	895894.69	15028050.	288857.20

Table II-13-6. Differences Between Without Fish Scenario and With Fish Scenario: Levels (Listing and Critical Habitat) ($1982 millions except employment)

Sectors	Output Change-Difference Between		Employment Change-Difference Between		Earnings Change-Difference Between	
	Scenario A1 and Without Fish	Scenario B1 and Without Fish	Scenario A1 and Without Fish	Scenario B1 and Without Fish	Scenario A1 and Without Fish	Scenario B1 and Without Fish
Livestock	3.30	0.99	77.	24.	0.45	0.08
Other Crops	5.07	4.03	506.	403.	2.68	1.95
Livestock Feed	-1.37	-0.11	-248.	-19.	-8.60	-0.08
Misc. Agriculture	3.02	0.14	180.	10.	1.47	-0.08
Non-petroleum Mines	2.82	3.02	39.	42.	1.43	1.14
Petroleum & Gas	0.06	0.54	0.	6.	0.12	0.14
New Construction	35.27	-2.15	424.	-25.	14.47	-2.60
Combined Manufacturing	41.25	-22.20	579.	-312.	18.86	-12.61
Food Products	8.15	-9.55	74.	-90.	2.12	-2.59
Wood Products	7.18	-4.35	128.	-78.	2.97	-2.07
Petroleum & Coal Products	-6.94	-2.04	-9.	-3.	-0.44	-0.25
Trans, Comm, & Utilities	12.98	-9.26	262.	-188.	7.75	-6.11
Recreation Services	-0.43	-6.26	-13.	-187.	0.82	-3.75
Electric Power Production	-0.95	-2.80	-14.	-43.	-0.29	-1.27
Wholesale/Retail Trade	9.75	-6.23	627.	-400.	6.63	-5.08
Finance/Insure, Real Estate	-16.80	12.36	505.	372.	-9.28	6.15
Household & Business Serv.	17.82	-9.98	548.	-306.	13.09	-8.75
Local Amusements	3.80	-2.69	92.	-65.	1.93	-1.56
Health/Educ. & Social Serv.	10.50	-8.30	393.	-310.	12.41	-12.71

F. Consumer and Producer Surplus Measures of the Effects of Listing and Critical Habitat

The CGE model allows a further extension of the analysis of the national economic efficiency impacts regarding the actions taken under listing and the proposed critical habitat.
Since household consumption is computed as (see Chapter II-7):

where ω_i denotes the share spent on good i and C is total consumption, it is possible to construct cost-of-living indices that are first-order approximations of consumer surplus changes.[93]

Two indices are commonly constructed for this purpose, the Laspeyres and the Paasche quantity indices. These are defined, respectively, as follows:

where the superscript n refers to the new prices and quantities and the superscript o refers to the old prices and quantities. These can be written in level form and the Laspeyres index is written as:

As Boadway and Bruce show, this is a first order approximation of the equivalent variation (EV) and the compensating variation (CV) associated with the quantity changes between the scenarios being investigated. In fact, since the higher order terms require more information than is observable in price and quantity changes, these indices are widely used to approximate changes in consumer surplus due to exogenous shocks to the economy.[94] Clearly, if these indices are positive (negative) consumer surplus has increased (decreased).

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[93] The following is adapted from Boadway and Bruce pp 212-213 and is also discussed in Varian (1992).

A measure of the change in producer surplus is computed directly in the CGE model as the change in rents earned in the producing sectors. Since capital is fixed in the short run, these rents represent producer surplus.

Under Scenario A1, aggregate consumer surplus increases by $25.60 million. Producer surplus is projected to decline by -$6.31 million. Under Scenario B1, aggregate consumer surplus decreases by -$27.59 million and producer surplus increases by $3.48 million. In both cases, the change in producer surplus is in the opposite direction to the change in consumer surplus. This is primarily due to the short-run assumption embodied in the model concerning the mobility of capital. Recall, that capital is assumed to be fixed across sectors in the short run. Thus, labor earns the rents associated with factor mobility and the expansion in the construction-related sectors generated by the thermal capacity expansion. Further, labor bears the costs associated with the economic contraction under Scenario B1.

G. Conclusions

This chapter has reported the national efficiency economic impacts associated with species listing and proposed critical habitat designation for the endangered fishes. The analysis has demonstrated that the overall national efficiency impacts depend on whether one treats the expansion in thermal generating capacity as a net addition to the level of economic activity or as a simple transfer from other sectors in the national economy. It is likely that the true situation lies in between these polar cases. Thus, the overall impact to the national economy lies between the values presented in this chapter.

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[94] Of course, there are various means of obtaining exact measures of consumer surplus changes from individual expenditure functions. This is widely used when dealing with changes in a price or quantity of a single good but the data requirements are beyond what is typically available in a general equilibrium analysis. In fact, the story is much more complex. The Laspeyres and Paasche indices just described relate to a single consumer. In order to aggregate these measures over all consumers in the economy some rather stringent conditions must be met. In particular, it must be that the marginal social utility of income is the same for all persons. This is not likely to be the case. However, policy questions must be addressed and it is common to add the surplus changes across consumers. Boadway and Bruce provide some rationale for this approach in pages 262-263.

The CGE analyses demonstrate the consequences of factor mobility in a way that was outside of the scope of the I-O analysis. In both scenarios investigated in this chapter there is an increase in the output in the livestock sector as a result of withdrawal of land from the production of livestock feed. This is a natural consequence of substitution among land use patterns. This result was not apparent in the I-O analysis presented in Chapters II-11 and II-12.

Volume II

Chapter 14: Disaggregating Listing From Critical Habitat Impacts

A. Overview

USFWS proposed critical habitat for four Colorado River endangered fish species on January 29, 1993 (58 FR 6578). The Endangered Species Act requires that critical habitat be designated based on the best scientific and commercial data available. The Act stipulates that economic and other relevant impacts must be evaluated when critical habitat is designated. The evaluation of economic and other relevant impacts is then used during the exclusion process. Areas may be excluded if economic or other benefits of exclusion outweigh the conservation and other benefits of designating an area as critical habitat, unless such exclusion would result in the extinction of the species.

The Act specifically prohibits the consideration of economic effects when determining whether a species should be listed, but requires an evaluation of economic and other relevant impacts of the critical habitat designation. Therefore, economic costs and benefits of critical habitat designation for the four Colorado River endangered fishes are defined as the economic effects that (1) exceed those that result from the listing, (2) exceed those economic effects resulting from voluntary actions taken by other Federal agencies under Section 7(a)(1) of the Act, and (3) exceed those from other regulatory mandated actions required by law, such as the Clean Water Act.

B. Assumptions

For the purposes of separating impacts between species listing and proposed critical habitat within the economic analysis for the designation of critical habitat for the four Colorado River endangered fishes, the following assumptions were used:

1. During the period of the economic analysis (1995-2020), progress towards recovery is being made for each species.

2. Generally, the threshold for an action to result in an adverse modification determination is less than that for Jeopardy. For example, an impact to a single backwater habitat may not jeopardize the continued existence of a species, but may result in adverse modification, i.e., appreciably diminish the value of that portion of critical habitat to contribute to the recovery and survival of the species.

3. As a species moves from near extinction towards recovery, the likelihood of any given project's impacts resulting in a Jeopardy situation decreases. This concept is graphically displayed in Figure II-14-1. Increasing species stability generally buffers the effect of localized impacts to the species as a whole. For example, the loss of a single individual out of a total population of 100 is more significant than the loss of an individual out of a total population of 10,000.

4. As a species moves from near extinction towards recovery, the likelihood of any given project action causing Adverse Modification remains relatively constant (Figure II-14-1). For example, regardless of population status of the species, the biological values associated with an individual habitat unit do not change. Also, the amount of habitat required to achieve species recovery does not fluctuate with changes in population levels. Therefore, if species recovery is the goal, the importance of habitat protection is constant whether populations are declining or increasing.

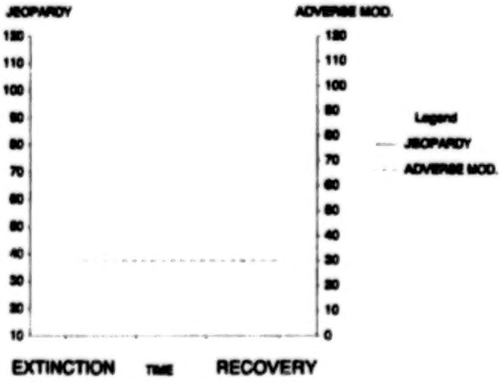

Figure II-14-1. Likelihood of Jeopardy and Adverse Modification Over Time.

C. Application

USFWS's application of the Jeopardy and Adverse Modification standards is central to the partitioning of costs between species listing and proposed critical habitat. Because critical habitat was not listed concurrently with these four fishes, a significant number of consultations using only the Jeopardy standard have occurred. For the proposed partitioning approach, an estimate of how the consultation process would have used Jeopardy and Adverse Modification, had critical habitat and the species been listed concurrently, was developed. To do this, USFWS examined the major factors affecting these fishes and estimated how well (logical) related project impacts would be addressed under Adverse Modification or Jeopardy. Table II-14-1 presents the parameters affecting these four fishes and the extent to which impacts on these activities are logically addressed under Jeopardy or Adverse Modification or both. This partitioning assumes that designation of critical habitat took place concurrently with species listing and that no programs such as the Recovery Implementation Program (RIP) exist. Table II-14-1 was used as the starting point by all three USFWS Field Offices, which contributed to the impact partition analysis (Utah/Colorado, Albuquerque, and Phoenix Field Offices).

Table II-14-1. Applicability of Jeopardy and Adverse Modification by Impact Type

IMPACTS	Jeopardy	Adverse Modification
Flows & Flow Timing	Partly[1]	Partly
Nonnative Fishes	Partly	Partly
Contaminants	Mostly	Somewhat
Floodplain Impacts	Somewhat	Mostly
Fish Passage	Somewhat	Mostly
Recreation	Mostly	Somewhat

1- Key to descriptors: Somewhat≈25%, Partly≈50%, Mostly≈75%

USFWS recognizes that the process to allocate the impacts of these four species' recovery between listing and critical habitat described below is only one possible scenario. However, USFWS believes that the impact allocation presented here is the most plausible forecast of future recovery activities and the effect critical habitat will have on these impacts. The RIP for the Upper Colorado River is central to recovery efforts for these four fishes in Colorado, Utah, and Wyoming. Similarly, the San Juan RIP is essential for the recovery of the Colorado squawfish and the razorback sucker in the San Juan Basin. These programs have as their goal the recovery of these species, and the following impact allocation is dependent upon the program's success. Should the RIP fail or be discontinued, USFWS expects that this impact distribution would be altered.

1. Impact Allocation for the Upper Colorado Basin

This partitioning of impact coverage provides a theoretical viewpoint for determining future impacts due to designation of critical habitat. The extensive history of consultations, which used only the Jeopardy standard, has moved actual application away from this theoretical viewpoint. This represents the degree of skew towards Jeopardy that past and current USFWS consultations and other actions (i.e., RIP) have had. To do this, USFWS relied upon the goals and stated intent of the RIP and its associated programs (the RIP Recovery Action Plan). Because the RIP has the goal of recovering the species and, therefore, is attempting to address many of the issues affecting survival of these fishes, it represents the cornerstone of USFWS's current recovery efforts. It also represents the identification of those issues as potential impacts of listing (Sections 7 and 9 of the Act, etc). In the context of this document, use of RIP is synonymous with listing impacts for the Upper Colorado River Basin (excluding the San Juan River Basin) except those impacts associated with (a) the direct impacts (nonflow issues) of new water projects, and (b) the impacts of environmental contaminants. Although the RIP has the stated goal of recovery for these fishes, uncertainty associated with long-term funding, legal and institutional factors, and the level of success of the various recovery activities remains. These uncertainties are discussed by impact type below:

a. Flows and Flow Timing

A major component of the RIP is to solve flow issues; therefore, USFWS believes it will address most or all of the flow related issues. Because there are future uncertainties beyond USFWS's control, the USFWS has not ascribed resolution of all flow issues to the RIP. These future uncertainties include but are not limited to funding, legal protection of instream flows, and the success rates of the various recovery activities.

b. Floodplain Impacts

The RIP does not currently constitute a Reasonable and Prudent Alternative (RPA) for direct impacts of new projects. The program does act as an RPA for direct impacts of historical projects and is directing some backwater restoration projects; however, many projects that impact floodplains are new projects and are not in the RIP's purview.

c. Fish Passage

The RIP has plans for restoration of fish passage at all technologically feasible structures in the Upper Basin. The RIP also has a program to improve fish passage at many agricultural diversions. Uncertainties associated with the future of the RIP, such as funding, account for the 5 percent of impacts not addressed by the RIP.

d. Recreation

The RIP is conducting angler education, angling mortality studies, and various other information and education efforts. However, the RIP does not cover direct impacts of projects such as boat ramps, floodplain campgrounds, or other recreational capital improvement projects.

e. Contaminants

Resolution of contaminant issues is not included under the RIP. The RIP does recognize contaminant issues as a concern, however, and supports efforts to address these impacts.

f. Nonnative Fishes

The RIP is addressing nonnative fish issues by using flow and information and education efforts to manage these fishes, and is working with the States on fish stocking and regulations. The USFWS and the States are also developing a stocking policy for nonnative fishes in accordance with procedures identified in the RIP. The high degree of uncertainty associated with potential solutions is responsible for determination of the percentage of impacts listed as being outside of the RIP.

Using the RIP and its goals as a guide, Table II-14-2 was developed. The percentages shown in the following tables designate the portion of each impact that is affected by the Act. USFWS recognizes that not all of the impacts that have contributed to the decline of these species can be rectified through the Endangered Species Act. The percentages in the tables below represent only that portion of the total impacts that would fall under the purview of the Act. This includes regulatory aspects of the Act such as Sections 7(a)(2) and 9, non-regulatory aspects such as Section 7(a)(1), and Section 6 and programs such as the RIP. Many impacts do not have a Federal linkage and, in general, will remain unaffected by designation of critical habitat and the requirements of the Act.

Table II-14-2. The Degree to Which the Recovery Implementation Program (RIP) Is Capable of Addressing Impacts.

IMPACT FROM:	Percentage of Habitat Protection Provided by RIP	Percentage Not Addressed by the RIP
Flows & Flow Timing[1]	80[2]	20
Nonnative Fishes	50	50
Contaminants	5	95
Floodplain Impacts	25	75
Fish Passage[1]	95	5
Recreation	50	50

[1] - The RIP is the Reasonable and Prudent Alternative for water depletions for all projects and for direct and indirect impacts of historical projects. This is represented by the high percentage of coverage attributed to the RIP for these categories.

[2] - Because of the uncertainties discussed above, no 100% or 0% coverage was allotted.

Table II-14-2 reflects the current situation as influenced by USFWS's past consultations and existing programs. To predict how USFWS might use Adverse Modification and Jeopardy in the future is the final product in this process. The theoretical argument presented in Table II-14-1 will be applied to the percentages of habitat protection not currently provided by listing (RIP and other existing actions, Table II-14-2, Column 3). For example, the theoretical viewpoint has a 50/50 split between Jeopardy and Adverse Modification for flows and flow timing (Table II-14-1). Table II-14-2 shows that 20 percent of flow timing issues may not be currently addressed by listing. Therefore, this remaining 20 percent of needed habitat protection is divided equally between listing and Adverse Modification (i.e., 10 percent each).

The influence of the RIP and other existing and past actions needs to be factored in order to account for continuity in USFWS's approach to recovery of these fishes. This is done by adding the listing portion of Table II-14-2, Column 2, after applying the theoretical percentage to Table II-14-2, Column 2. In the case of the flows and flow timing example used above, 10 percent would be added to the 80 percent presented in Table II-14-2 Column 2. Therefore, for the purposes of flows and flow timing, partitioning impacts between adverse modification and listing on flow-related issues, 90 percent of the impacts would be listing impacts (80 percent RIP plus 10 percent other listing impacts). Once again, this partitioning accounts for uncertainty that cannot be predicted.

The basic formula for any of the issues listed in Table II-14-3 is: (Table II-14-1, Column 2 x Table II-14-2, Column 3) plus Table II-14-2, Column 2 yields the percent of future impacts attributable to listing.

Table II-14-3 was derived applying this approach to each category.

Table II-14-3. Percentage of Major Impact Categories Addressed by Either Listing or Adverse Modification at Recovery

IMPACTS	LISTING (%)	AD.MOD. (%)	▵ W/TIME[1]
Flows & Flow Timing	90	10	NO[2]
Nonnative Fishes	75	25	YES
Contaminants	76	24	YES
Floodplain Impacts	44	56	YES
Fish Passage	96	4	NO[2]
Recreation	88	12	YES

[1] - As a species moves from near extinction to recovery, the impacts attributable to adverse modification increase.

[2] - As long as the RIP is in place, impacts related to these activities will be addressed in accordance with that program.

Percentages listed under Adverse Modification are those which will be used to determine impacts attributable to designation of critical habitat. The numbers listed represent the maximum influence or impact that Adverse Modification will have. This occurs close to the recovery point for the species. Some activity percentages will change during the period covered by the economic analysis. How long it will take to reach recovery for these four fishes is currently unknown. Therefore, a recovery date of 2003 from the RIP was used to represent the earliest date in which recovery could occur. The other end of the recovery timeline is represented by only minimal improvement in population status during the period of economic analysis. Since population status affects the Jeopardy threshold but not the Adverse Modification threshold (Assumptions 2 through 4) the above two scenarios will provide a range from which impacts associated with Adverse Modification can be estimated.

Tables II-14-4 and II-14-5 present the percent of impact addressed by Adverse Modification for those four activities that change over time in relation to a standard logistic population curve.[95] In order to develop the "scale" discussed above, two scenarios are presented for each activity. One scenario shows recovery occurring in accordance with the goals of the RIP in the year 2003 (optimistic). The other shows minimal improvement in populations by the year 2003. A point near the upper asymptote on the population curve was selected as representing the point of recovery (delisting). Because Adverse Modification has little additive effect when populations are near extinction (almost any impact is Jeopardy), the percentage of impact addressed by Adverse Modification is correspondingly low. The percentage of impacts addressed by Adverse Modification, for each year evaluated in the economic analysis, was estimated by using a logistic growth curve. These percentages were then used to determine the impacts of recovery that are attributable to the designation of critical habitat. Activities that are completely addressed within the RIP remain constant through the period of the economic analysis.

Table II-14-4. Activity and Percentage of Impacts Attributable to Critical Habitat with Recovery in the Year 2003.

Year	Flows and Flow Timing	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	10	3	4	4	4	2
1995	10	12	14	25	4	6
2000	10	22	22	50	4	11
2005	10	25	24	56	4	13
2010	10	25	24	56	4	13
2015	10	25	24	56	4	13
2020	10	25	24	56	4	13

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[95] The logistic population growth curve was selected to represent species recovery in a limiting environment.

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Table II-14-5. Activity and Percentage of Impacts Attributable to Critical Habitat with Minimal Recovery Progress by 2003.

Year	Flows and Flow Timing	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	10	2	2	2	4	1.5
1995	10	3	3	3	4	2.0
2000	10	4	5	6	4	3.0
2005	10	6	7	10	4	4.0
2010	10	9	10	17	4	5.5
2015	10	12	14	25	4	7.0
2020	10	16	17	35	4	8.0

2. Impact Allocation for the San Juan River Basin

The only difference between the impact partitioning for the Upper Basin and the San Juan River Basin was in the area of contaminant impacts (Table II-14-7). The RIP for the San Juan and a recent biological opinion issued to the Bureau of Land Management on oil and gas impacts provided the basis for the change.

Table II-14-6. Applicability of Jeopardy and Adverse Modification by Impact Type

IMPACTS	Jeopardy	Ad. Mod.
Flows & Flow Timing	Partly[1]	Partly
Nonnative Fishes	Partly	Partly
Contaminants	Mostly	Somewhat
Floodplain Impacts	Somewhat	Mostly
Fish Passage	Somewhat	Mostly
Recreation	Mostly	Somewhat

[1]- Key to descriptors: Somewhat ≈ 25%, Partly ≈ 50%, Mostly ≈ 75%

Table II-14-7. Assigned Values Reflecting the Degree to Which Llisting is Committed to Solving Impacts.

IMPACTS	Percentage of Habitat Protection Provided by RIP	Percentage Not Addressed by the RIP
Flows & Flow Timing	80	20
Nonnative Fishes	25	75
Contaminants	80	20
Floodplain Impacts	25	5
Fish Passage	95	95
Recreation	5	50

Table II-14-8. Percentage of Major Impact Categories Addressed by Either "Listing" or Adverse Modification at Recovery

IMPACTS	LISTING (%)	AD.MOD. (%)	Δ W/TIME
Flows & Flow Timing	90	10	NO[1]
Nonnative Fishes	62	38	YES
Contaminants	95	5	YES
Floodplain Impacts	44	56	YES
Fish Passage	96	4	NO[1]
Recreation	76	24	YES

[1] - As long as the RIP is in place, impacts related to these activities will be addressed in accordance with that program.

Table II-14-9. Activity and Percentage of Costs Attributable to Critical Habitat with Recovery in the Year 2003.

Year	Flows and Flow Timing	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	10	4	2	4	4.0	4
1995	10	19	4	26	4.0	14
2000	10	34	5	50	4.0	22
2005	10	38	5	56	4.0	24
2010	10	38	5	56	4.0	24
2015	10	38	5	56	4.0	24
2020	10	38	5	56	4.0	24

Table II-14-10. Activity and Percentage of Costs Attributable to Critical Habitat with Minimal Recovery Progress by 2003.

Year	Flows and Flow Timing	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	10	2	1	2	4.0	1.5
1995	10	3	2	3	4.0	3.0
2000	10	6	2	6	4.0	4.5
2005	10	9	3	11	4.0	7.0
2010	10	14	3	17	4.0	10.0
2015	10	19	4	26	4.0	14.0
2020	10	25	4	35	4.0	17.0

3. Impact Partitioning for the Lower Mainstem Colorado River and the Salt, Gila, and Verde Rivers

Owing to the distribution of the four endangered fish species and the types of Federal actions undergoing consultation in the Lower Basin, the consultation history for these fishes is different from that of the Upper Basin.

In the Lower Basin, no program similar to the RIP is in place for Section 7 Consultations. As a result, any RPA's developed for Jeopardy biological opinions are more specifically crafted to the circumstances of the project. The Lower Basin also has a more limited consultation history to draw on because considerably fewer new Federal projects have been proposed for areas containing the fishes in this study.

The theoretical starting point allocating percentage of effects used in Jeopardy and Adverse Modification decisions contained in Table II-14-1 applies to the Lower Basin as well as the Upper Basin. The logical determinations used to develop this table are valid regardless of the actual consultation history.

Because there is no RIP in the Lower Basin, and because RPA's are more specifically crafted, Table II-14-2 does not apply. Table II-14-11 was developed to reflect past consideration of factors from Table II-14-1 in determining Jeopardy. The percentages in Table II-14-11 were developed from existing and draft biological opinions and analyses of project types that might be proposed in the Lower Basin.

Table II-14-11. Current Percentage of Impacts Being Addressed Using Jeopardy Standard During Section 7 Consultations.

Impact Type	% Considered	% Not Considered
Flows	70	30
Nonnative Fish	75	25
Contaminants	50	50
Floodplains	25	75
Fish Passage	70	30
Recreation	50	50

Using the information in Tables II-14-1 and II-14-11, Table II-14-12 was developed for the Lower Basin just as Table II-14-3 was prepared for the Upper Basin.

Table II-14-12. Percentage of Major Impact Categories Addressed by Either "Listing" or Adverse Modification at Recovery

ACTIVITY	% LISTING	% AD. MOD.	CHANGE W/TIME?
Flows	85	15	YES
Nonnative Fish	87	13	YES
Contaminants	87	13	YES
Floodplains	44	56	YES
Fish Passage	77	23	YES
Recreation	87	13	YES

The percentages listed under Adverse Modification are those that will be used to determine the impacts attributable to the designation of critical habitat. These figures represent the maximum impact or influence of critical habitat, which, as discussed earlier, occurs near the recovery point for the species. Over time, the percentages attributable to critical habitat will change as the status of the species changes. For the purpose of continuity in the economic analysis, the same two recovery scenarios applied to the Upper Basin were used to represent this change. The first assumes that significant recovery has occurred by the year 2003 (Table II-14-13). The second assumes that only limited progress toward recovery has occurred by the year 2003 (Table II-14-14).

Table II-14-13. The Percentage of Impacts Attributable to Critical Habitat if Substantial Recovery Has Occurred by 2003.

Year	Flows	Nonnative Fish	Contaminants	Floodplain	Passage	Recreation
1989	3	3	3	4	3	3
1995	8	7	7	25	11	7
2000	14	11	11	50	20	11
2005	15	13	13	56	23	13
2010	15	13	13	56	23	13
2015	15	13	13	56	23	13
2020	15	13	13	56	23	13

Table II-14-14. Only Limited Progress Toward Recovery Has Occurred by the Year 2003.						
Year	**Flows**	**Nonnative Fish**	**Contaminants**	**Floodplain**	**Passage**	**Recreation**
1989	1	1	1	2	2	1
1995	2	2	2	4	3	2
2000	3	3	3	6	4	3
2005	5	4	4	10	6	4
2010	6	6	6	25	9	6
2015	8	7	7	34	12	7
2020	10	8	8	56	15	8

The listing plus proposed critical habitat direct impacts for each of the seven States and the Colorado River Basin region are reported in Table II-14-15. The allocations reported in Tables II-14-9 and II-14-13 yield the direct impacts, due to the proposed critical habitat designation, that are reported in Table II-14-16. These figures are based on a scenario for which substantial recovery of the endangered species has occurred by the year 2003.

Table II-14-15. Direct Economic Impacts (1982$ Millions)
(Listing and Critical Habitat)

Sector	Year 1995	2000	2005	2010	2015	2020
Arizona						
Recreation	0.000	-0.028	-0.065	-0.098	-0.130	-0.162
Electric Power	-0.104	-0.011	0.095	0.056	-0.130	-0.061
TOTAL DIRECT IMPACTS	-0.104	-0.039	0.030	-0.042	-0.260	-0.223
California						
Other Crops	0.524	1.906	4.370	5.812	8.379	10.924
Livestock Feed	0.100	0.361	0.826	1.099	1.584	2.065
TOTAL DIRECT IMPACTS	0.624	2.267	5.196	6.911	9.963	12.989
Colorado						
Livestock Feed	-0.230	-0.459	-0.812	-0.857	-1.034	-1.321
Other Crops	-0.063	-0.126	-0.173	-0.221	-0.272	-0.320
Recreation	-0.229	-0.458	-0.458	-0.458	-0.458	-0.458
Electric Power	-0.198	-0.359	-0.819	-0.419	-0.758	-0.066
Non-petroleum Mining	0.131	0.198	0.311	0.138	0.161	0.141
Oil and Gas Mining	0.250	0.025	0.069	0.149	1.655	0.096
Construction	0.635	0.635	0.635	0.635	0.635	0.635
Combined Mfg.	0.635	0.635	0.635	0.635	0.635	0.635
TOTAL DIRECT IMPACTS	0.931	0.091	-0.612	-0.398	0.564	-0.658
Nevada						
Recreation	0.000	-0.028	-0.065	-0.098	-0.130	-0.163
TOTAL DIRECT IMPACTS	0.000	-0.028	-0.065	-0.098	-0.130	-0.163
New Mexico						
Livestock Feed	-0.115	-0.401	-1.118	-1.655	-2.558	-3.396
Electric Power	-0.021	-0.044	-0.046	-0.045	-0.044	-0.049
TOTAL DIRECT IMPACTS	-0.136	-0.445	-1.164	-1.700	-2.602	-3.445
Utah						
Livestock Feed	0.000	-0.019	-0.042	-0.084	-0.088	-0.092
Recreation	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Electric Power	-0.021	-0.014	-0.031	-0.057	-0.093	-0.118
Non-petroleum Mining	0.093	0.136	0.140	0.125	0.126	0.136
TOTAL DIRECT IMPACTS	-0.217	-0.186	-0.222	-0.305	-0.344	-0.363
Wyoming						
Livestock Feed	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036
Recreation	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
Non-petroleum Mining	0.000	0.000	0.005	0.001	0.010	0.008
TOTAL DIRECT IMPACTS	-0.047	-0.047	-0.042	-0.046	-0.037	-0.039

Table II-14-15. Direct Economic Impacts (1982$ Millions)
(Listing and Critical Habitat)

Sector	Year 1995	 2000	 2005	 2010	 2015	 2020
		Colorado River Basin				
Livestock Feed	-3.415	-0.777	-1.542	-1.871	-2.535	-3.317
Other Crops	0.551	1.558	3.724	5.041	7.440	9.887
Recreation	-0.143	-0.372	-0.409	-0.435	-0.461	-0.487
Electric Power	-0.388	-0.412	-0.859	-0.490	-1.015	-0.046
Non-petroleum Mining	0.236	0.339	0.478	0.369	0.594	0.390
Oil and Gas Mining	0.158	0.115	0.364	0.263	0.847	0.176
Construction	0.623	0.635	0.667	0.667	0.667	0.667
Combined Manufacturing	0.623	0.635	0.667	0.667	0.667	0.667
TOTAL DIRECT IMPACTS	12.711	1.721	3.090	4.211	6.204	7.937

Table II-14-16. Direct Economic Impacts (1982$ Millions)
(Critical Habitat Only)

Sector	Year 1995	2000	2005	2010	2015	2020
			Arizona			
Recreation	0.000	-0.028	-0.065	-0.098	-0.130	-0.162
Electric Power	-0.104	-0.011	0.095	0.056	-0.130	-0.061
TOTAL DIRECT IMPACTS	-0.104	-0.039	0.030	-0.042	-0.260	-0.223
			California			
Other Crops	0.524	1.906	4.370	5.812	8.379	10.924
Livestock Feed	0.100	0.361	0.826	1.099	1.584	2.065
TOTAL DIRECT IMPACTS	0.624	2.267	5.196	6.911	9.963	12.989
			Colorado			
Livestock Feed	-0.230	-0.459	-0.812	-0.857	-1.034	-1.321
Other Crops	-0.063	-0.126	-0.173	-0.221	-0.272	-0.320
Recreation	-0.229	-0.458	-0.458	-0.458	-0.458	-0.458
Electric Power	-0.198	-0.359	-0.819	-0.419	-0.758	-0.066
Non-petroleum Mining	0.131	0.198	0.311	0.138	0.161	0.141
Oil and Gas Mining	0.250	0.025	0.069	0.149	1.655	0.096
Construction	0.635	0.635	0.635	0.635	0.635	0.635
Combined Mfg.	0.635	0.635	0.635	0.635	0.635	0.635
TOTAL DIRECT IMPACTS	0.931	0.091	-0.612	-0.398	0.564	-0.658
			Nevada			
Recreation	0.000	-0.028	-0.065	-0.098	-0.130	-0.163
TOTAL DIRECT IMPACTS	0.000	-0.028	-0.065	-0.098	-0.130	-0.163
			New Mexico			
Livestock Feed	-0.115	-0.401	-1.118	-1.655	-2.558	-3.396
Electric Power	-0.021	-0.344	-0.046	-0.045	-0.044	-0.049
TOTAL DIRECT IMPACTS	0.136	-0.445	-1.164	-1.700	-2.602	-3.445
			Utah			
Livestock Feed	0.000	-0.019	-0.042	-0.084	-0.088	-0.092
Recreation	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Electric Power	-0.021	-0.014	-0.031	-0.057	-0.093	-0.118
Non-petroleum Mining	0.093	0.136	0.140	0.125	0.126	0.136
TOTAL DIRECT IMPACTS	-0.217	-0.186	-0.222	-0.305	-0.344	-0.363
			Wyoming			
Livestock Feed	-0.036	-0.036	-0.036	-0.036	-0.036	-0.036
Recreation	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
Non-petroleum Mining	0.000	0.000	0.005	0.001	0.010	0.008
TOTAL DIRECT IMPACTS	-0.047	-0.047	-0.042	-0.046	-0.037	-0.039

Table II-14-16. Direct Economic Impacts (1982$ Millions)
(Critical Habitat Only)

Sector	Year 1995	2000	2005	2010	2015	2020
			Colorado River Basin			
Livestock Feed	-0.318	-0.777	-1.542	-1.871	-2.535	-3.317
Other Crops	0.551	1.558	3.724	5.041	7.440	9.887
Recreation	-0.143	-0.372	-0.409	-0.435	-0.461	-0.487
Electric Power	-0.388	-0.412	-0.859	-0.490	-1.015	-0.046
Non-petroleum Mining	0.236	0.339	0.478	0.369	0.594	0.390
Oil and Gas Mining	0.158	0.115	0.364	0.263	0.847	0.176
Construction	0.623	0.635	0.667	0.667	0.667	0.667
Combined Manufacturing	0.623	0.635	0.667	0.667	0.667	0.667
TOTAL DIRECT IMPACTS	1.342	1.721	3.090	4.211	6.204	7.937

D. Appendix to Chapter 14

The formula used to derive the percentage of impacts attributable to critical habitat over time was adapted from *Ecology: The Experimental Analysis of Distribution and Abundance* (1978) by C. J. Krebs. This formula for a logistic population curve is presented below.

$$\frac{K}{1+e^{a-rt}}$$

Where: K = a point approaching recovery represented by ≈ 90 percent of the upper asymptote

$$a = ln\frac{K-N}{N}$$

r = per capita rate of population growth (slope of population growth)

t = time (present to year of recovery)

N = estimated percent usage of adverse modification in Section 7 Consultations or percent cost associated with critical habitat

Volume II

Chapter 15: The Incremental Impacts of Designating Critical Habitat for the Four Fishes

A. Overview

The process of listing and designating proposed critical habitat will affect the allocation of resources in the economy. This reallocation will yield economic impacts. The Endangered Species Act specifically stipulates that only the incremental impacts of critical habitat designation are to be considered in evaluating the benefits and costs of protecting and recovering the species.

This chapter presents the incremental economic impacts of proposed critical habitat designation. The percentages utilized for allocating direct economic impacts (Chapters II-9 and II-10) between species listing and proposed critical habitat designation assumes endangered fishes recovery in the Upper Basin and substantial recovery in the Lower Basin by 2003 (see Tables II-14-4 and II-14-13).

Each of the direct impacts categories was assigned to a particular classification (flow and flow timing, nonnative fishes, and so on). All agriculture sector impacts are included in the overall flow and flow timing classification. Total direct agriculture sector impacts, due to species listing, for each State and the Basin are 90 percent of the total direct impacts in these sectors. Thus, critical habitat designation represents 10 percent of the total agricultural direct impacts. Given the nature of the Wyoming and Utah recreation impacts, 75 percent and 100 percent respectively were included in the flows and flow timing classification and thus 90 percent of these impacts were assumed to be listing effects and 10 percent critical habitat effects. Finally, for the State of Colorado, 75 percent of the Gunnison River recreation impacts were included in the flows and flow timing classification.

The nonnative fishes classification captured the remaining recreation sector impacts. The remaining 25 percent of the recreation impacts for the Gunnison River in Colorado were included in the nonnative fishes category. For Arizona, Nevada, and the San Juan River in Colorado, 100 percent of the recreation impacts were assigned to impacts arising from restrictions on the nonnative fishes.

The discussion in Chapters II-11, II-12, and II-13 raised several issues concerning the measurement of the economic impacts arising from listing and proposed designation of critical habitat. These are also relevant to the measurement of the impacts associated with the proposed critical habitat designation. Economic impacts may be measured at the State- and regional-level and at the national level. In this chapter the economic impacts associated with critical habitat are presented for each of the model stages developed for this project. The results produced by the individual State-level I-O models (Chapter II-11) and the Colorado River Basin regional I-O model (Chapter II-12) represent regional impacts as opposed to national economic efficiency impacts (Chapter II-13). The regional results reflect purely regional impacts associated with the proposed critical habitat designation and permit assessment of the relative impacts across the individual States.

National economic efficiency effects are calculated by the CGE model. As discussed in Chapter II-13, the analyst must make some adjustments to the direct impact data to omit the regional direct impacts that are pure transfers to or from the rest of the national economy. A pure transfer arises when the regional impact is generated by displacing a resource from an equally valued use elsewhere in the national economy. In this case there are no net gains to the national economy.

B. Methodology

The procedures for determining the incremental impacts of critical habitat listing were as follows. Each direct impact was weighted by the percentage attributable to listing effects based on the allocation discussed above and the weighting scheme developed in Chapter II-14. The adjusted direct economic impacts were inputted into the model stages. The models were re-run. This process yielded impacts for listing only. The results were then netted from the total impacts presented in Chapters II-11, II-12, and II-13 to obtain the incremental impacts of critical habitat designation. State-level results are discussed first, followed by the results of the basin-wide I-O model and then by the results from the CGE model of the basin.

C. Arizona - State-Level Regional Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years, due to critical habitat are reported in Table II-15-AZ-1. The total annual impacts range from -$0.129 million in 1995 to -$0.843 in 2020. The cumulative impacts are reported in Table II-15-AZ-2 in present value terms for various discount rates. The present value of the cumulative impacts over the entire study period amounts to -$4.555 million at a 3 percent discount rate (-$3.067 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-AZ-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 1995 approximately 1 job is projected to be foregone in the Arizona economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 7 jobs foregone. That is, there are projected to be 7 fewer jobs in 2010 than there would be without endangered fishes actions.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-AZ-4. In 1995 the annual aggregate earnings impact is -$0.027 million and in 2005 it is -$0.051 million. The present value of the earnings impacts is -$1.39 million at a 3 percent discount rate (see Table II-15-AZ-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in Arizona is reported in Table II-15-AZ-6. In 1995 the total annual impact is projected to be -$0.005 million. Over the study period the present value of the impacts at a 3 percent discount rate is -$0.226 million (see Table II-15-AZ-7). Annual impacts in personal income tax are reported in Table II-15-AZ-8. The present value of the impacts overtime reported in Table II-15-AZ-8 at 3 percent discount rate is -$0.348 million (see Table II-15-AZ-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

Two tables reporting summary measures of the regional impacts are presented. Table II-15-AZ-10 reports a measure of the percentage changes of the with fish projections relative to the without fish projections. These values are computed by summing the without fish and the with fish measures over the time period of the study, subtracting the with fish value from the without fish value and expressing this difference as a percentage of the without fish value. These differences are presented in present percentage value deviations for the discount rates reported in Table II-15-AZ-10. The differences are reported for the four aggregate measures being used in the State and regional model stages: output, earnings, indirect business taxes, and personal income taxes.

Data reported in Table II-15-AZ-10 relate the present value of the percentage differences between the without fish projection and the impacts under the with fish projection that are due to the proposed critical habitat designation to the without fish projection. Thus, Table II-15-AZ-10 shows that there is a negative impact to the aggregate output over the study period and that this impact is -0.0002 percent of the without fish projected stream of output (at a 3 percent discount rate). Thus, the with fish output level is predicted to be reduced by two-ten thousandths of a percent relative to the without fish scenario.

In Table II-15-AZ-11 the annualized impact on output is reported as a -$0.284 million over the entire study period for a 0 percent discount rate. When this stream is discounted at 3 percent the annualized output impact is reported as -$0.228 million (-$228,000). At this same discount rate the annualized earnings impact is reported as -$0.070 million. Indirect business taxes annualized impact is -$0.011 million (at 3 percent) and the annualized impact to personal income taxes is -$0.017 million. Total annualized government revenue impact is -$0.028.

Table II-15-AZ-1. Arizona: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.006
Other Crops	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
Livestock Feed	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Non-petroleum Mines	0.000	-0.002	-0.003	0.000	0.001	-0.002	-0.004
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	-0.006	-0.007	-0.003	-0.001	-0.010	-0.015
Combined Manufacturing	0.000	-0.002	-0.003	-0.002	-0.002	-0.005	-0.008
Food Products	0.000	0.000	-0.001	-0.004	-0.007	-0.012	-0.018
Wood Products	0.000	0.000	-0.001	-0.001	-0.002	-0.004	-0.006
Petroleum & Coal Products	0.000	-0.002	-0.002	-0.001	0.000	-0.004	-0.006
Transp, Comm, & Utilities	0.000	-0.008	-0.010	-0.005	-0.004	-0.018	-0.028
Recreation Services	0.000	-0.001	-0.029	-0.097	-0.201	-0.341	-0.515
Electric Power Production	0.000	-0.103	-0.122	-0.032	0.022	-0.111	-0.174
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Finance, Insurance, Real Estate	0.000	-0.002	-0.003	-0.005	-0.008	-0.017	-0.025
Household and Business Services	0.000	-0.002	-0.003	-0.005	-0.009	-0.017	-0.026
Local Amusements	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Government Industries	0.000	-0.001	-0.001	-0.001	-0.001	-0.002	-0.004
TOTAL	0.000	-0.129	-0.186	-0.159	-0.218	-0.553	-0.843

Table II-15-AZ-2. Arizona: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.057	-0.027	-0.017	-0.006
Other Crops	-0.020	-0.009	-0.006	-0.002
Livestock Feed	-0.008	-0.004	-0.002	-0.001
Misc. Agriculture	-0.007	-0.004	-0.002	-0.001
Non-petroleum Mines	-0.051	-0.031	-0.024	-0.014
Petroleum & Gas Production	-0.001	0.000	0.000	0.000
New Construction	-0.183	-0.103	-0.074	-0.038
Combined Manufacturing	-0.094	-0.050	-0.035	-0.016
Food Products	-0.179	-0.085	-0.053	-0.018
Wood Products	-0.062	-0.030	-0.019	-0.007
Petroleum & Coal Products	-0.066	-0.037	-0.026	-0.013
Transp, Comm, & Utilities	-0.317	-0.174	-0.123	-0.060
Recreation Services	-4.888	-2.317	-1.446	-0.487
Electric Power Production	-2.305	-1.397	-1.053	-0.596
Wholesale/Retail Trade	-0.002	-0.001	-0.001	0.000
Finance, Insurance, Real Estate	-0.247	-0.122	-0.079	-0.030
Household and Business Services	-0.261	-0.129	-0.083	-0.032
Local Amusements	-0.016	-0.008	-0.005	-0.002
Health, Education, Social Services	-0.014	-0.007	-0.005	-0.002
Government Industries	-0.037	-0.020	-0.014	-0.006
TOTAL EFFECTS	-8.814	-4.555	-3.067	-1.332

Table II-15-AZ-3. Arizona: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	0.000	0.001	-0.004	-0.013	-0.026	-0.043	-0.064
Other Crops	0.000	0.000	-0.002	-0.007	-0.014	-0.024	-0.036
Livestock Feed	0.000	0.000	0.000	-0.002	-0.003	-0.005	-0.008
Misc. Agriculture	0.000	-0.001	-0.004	-0.008	-0.015	-0.028	-0.043
Non-petroleum Mines	0.000	-0.033	-0.037	-0.007	0.010	-0.034	-0.053
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	-0.058	-0.070	-0.029	-0.012	-0.101	-0.155
Combined Manufacturing	0.000	-0.016	-0.022	-0.017	-0.026	-0.064	-0.087
Food Products	0.000	0.000	-0.015	-0.049	-0.101	-0.167	-0.247
Wood Products	0.000	-0.005	-0.012	-0.020	-0.039	-0.070	-0.105
Petroleum & Coal Products	0.000	-0.003	-0.004	-0.001	-0.001	-0.006	-0.009
Transp, Comm, & Utilities	0.000	-0.118	-0.150	-0.074	-0.055	-0.260	-0.404
Recreation Services	0.000	-0.022	-0.926	-3.088	-6.415	-10.883	-16.447
Electric Power Production	0.000	-0.558	-0.658	-0.173	0.118	-0.597	-0.939
Wholesale/Retail Trade	0.000	-0.005	-0.003	0.001	-0.003	-0.016	-0.019
Finance, Insurance, Real Estate	0.000	-0.010	-0.019	-0.033	-0.052	-0.118	-0.174
Household and Business Services	0.000	-0.044	-0.080	-0.115	-0.191	-0.388	-0.593
Local Amusements	0.000	-0.005	-0.009	-0.013	-0.023	-0.046	-0.070
Health, Education, Social Services	0.000	0.003	-0.006	-0.012	-0.016	-0.025	-0.035
Government Industries	0.000	-0.030	-0.045	-0.026	-0.034	-0.111	-0.166
TOTAL	0.000	-0.905	-2.065	-3.685	-6.897	-12.986	-19.654

Table II-15-AZ-4. Arizona: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 1989	1995	2000	2005	2010	2015	2020
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	-0.002	-0.002	0.000	0.001	-0.002	-0.003
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	-0.002	-0.003	-0.001	0.000	-0.004	-0.006
Combined Manufacturing	0.000	-0.001	-0.001	-0.001	-0.001	-0.002	-0.004
Food Products	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.004
Wood Products	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.002
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	-0.003	-0.004	-0.002	-0.002	-0.008	-0.012
Recreation Services	0.000	0.000	-0.011	-0.036	-0.075	-0.128	-0.193
Electric Power Production	0.000	-0.017	-0.019	-0.005	0.003	-0.018	-0.028
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Finance, Insurance, Real Estate	0.000	0.000	0.000	-0.001	-0.001	-0.003	-0.004
Household and Business Services	0.000	-0.001	-0.002	-0.002	-0.004	-0.008	-0.012
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Government Industries	0.000	-0.001	-0.001	-0.001	-0.001	-0.002	-0.003
TOTAL	0.000	-0.027	-0.044	-0.051	-0.084	-0.180	-0.274

Table II-15-AZ-5. Arizona: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.005	-0.003	-0.002	-0.001
Other Crops	-0.004	-0.002	-0.001	0.000
Livestock Feed	0.000	0.000	0.000	0.000
Misc. Agriculture	-0.003	-0.002	-0.001	0.000
Non-petroleum Mines	-0.034	-0.021	-0.016	-0.009
Petroleum & Gas Production	0.000	0.000	0.000	0.000
New Construction	-0.070	-0.040	-0.029	-0.015
Combined Manufacturing	-0.040	-0.021	-0.014	-0.006
Food Products	-0.043	-0.021	-0.013	-0.004
Wood Products	-0.023	-0.011	-0.007	-0.003
Petroleum & Coal Products	-0.004	-0.002	-0.002	-0.001
Transp, Comm, & Utilities	-0.131	-0.072	-0.051	-0.025
Recreation Services	-1.829	-0.867	-0.541	-0.183
Electric Power Production	-0.369	-0.223	-0.168	-0.095
Wholesale/Retail Trade	-0.001	-0.001	0.000	0.000
Finance, Insurance, Real Estate	-0.040	-0.019	-0.013	-0.005
Household and Business Services	-0.122	-0.060	-0.039	-0.015
Local Amusements	-0.007	-0.003	-0.002	-0.001
Health, Education, Social Services	-0.007	-0.003	-0.002	-0.001
Government Industries	-0.035	-0.019	-0.013	-0.006
TOTAL EFFECTS	-2.768	-1.390	-0.914	-0.370

Table II-15-AZ-6. Arizona: Indirect Business Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Combined Manufacturing	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	0.000	-0.001	0.000	0.000	-0.001	-0.002
Recreation Services	0.000	0.000	-0.002	-0.005	-0.011	-0.019	-0.029
Electric Power Production	0.000	-0.004	-0.005	-0.001	0.001	-0.004	-0.007
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Finance, Insurance, Real Estate	0.000	0.000	0.000	-0.001	-0.001	-0.003	-0.004
Household and Business Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	-0.005	-0.008	-0.008	-0.013	-0.029	-0.043

Table II-15-AZ-7. Arizona: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.002	-0.001	-0.001	0.000
Other Crops	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000
Non-petroleum Mines	-0.003	-0.002	-0.001	-0.001
Petroleum & Gas Production	0.000	0.000	0.000	0.000
New Construction	-0.003	-0.001	-0.001	-0.001
Combined Manufacturing	-0.001	-0.001	0.000	0.000
Food Products	-0.002	-0.001	-0.001	0.000
Wood Products	-0.001	0.000	0.000	0.000
Petroleum & Coal Products	-0.002	-0.001	-0.001	0.000
Transp, Comm, & Utilities	-0.018	-0.010	-0.007	-0.004
Recreation Services	-0.276	-0.131	-0.082	-0.028
Electric Power Production	-0.091	-0.055	-0.041	-0.023
Wholesale/Retail Trade	-0.001	0.000	0.000	0.000
Finance, Insurance, Real Estate	-0.039	-0.019	-0.012	-0.005
Household and Business Services	-0.004	-0.002	-0.001	0.000
Local Amusements	-0.002	-0.001	-0.001	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL EFFECTS	-0.445	-0.226	-0.150	-0.063

Table II-15-AZ-8. Arizona: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	-0.001	-0.001	0.000	0.000	-0.001	-0.001
Combined Manufacturing	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Food Products	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	-0.001	-0.001	-0.001	0.000	-0.002	-0.003
Recreation Services	0.000	0.000	-0.003	-0.009	-0.019	-0.032	-0.048
Electric Power Production	0.000	-0.004	-0.005	-0.001	0.001	-0.004	-0.007
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Finance, Insurance, Real Estate	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Household and Business Services	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
TOTAL	0.000	-0.007	-0.011	-0.013	-0.021	-0.045	-0.069

Table II-15-AZ-9. Arizona: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.001	-0.001	0.000	0.000
Other Crops	-0.001	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000
Misc. Agriculture	-0.001	0.000	0.000	0.000
Non-petroleum Mines	-0.008	-0.005	-0.004	-0.002
Petroleum & Gas Production	0.000	0.000	0.000	0.000
New Construction	-0.018	-0.010	-0.007	-0.004
Combined Manufacturing	-0.010	-0.005	-0.004	-0.002
Food Products	-0.011	-0.005	-0.003	-0.001
Wood Products	-0.006	-0.003	-0.002	-0.001
Petroleum & Coal Products	-0.001	-0.001	0.000	0.000
Transp, Comm, & Utilities	-0.033	-0.018	-0.013	-0.006
Recreation Services	-0.457	-0.217	-0.135	-0.046
Electric Power Production	-0.092	-0.056	-0.042	-0.024
Wholesale/Retail Trade	-0.001	0.000	0.000	0.000
Finance, Insurance, Real Estate	-0.010	-0.005	-0.003	-0.001
Household and Business Services	-0.031	-0.015	-0.010	-0.004
Local Amusements	-0.002	-0.001	-0.001	0.000
Health, Education, Social Services	-0.002	-0.001	-0.001	0.000
Government Industries	-0.009	-0.005	-0.003	-0.001
TOTAL EFFECTS	-0.693	-0.348	-0.229	-0.093

Table II-15-AZ-10. Arizona: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

	Total Effects			
Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output	-0.0003	-0.0002	-0.0002	-0.0001
Earnings	-0.0002	-0.0002	-0.0001	-0.0001
Indirect Business Taxes	-0.0003	-0.0002	-0.0002	-0.0001
Personal Income Taxes	-0.0002	-0.0002	-0.0001	-0.0001

Table II-15-AZ-11. Arizona: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.284	-0.228	-0.197	-0.005
Earnings	-0.089	-0.070	-0.059	-0.001
Indirect Business Taxes	-0.014	-0.011	-0.100	-0.000
Personal Income Taxes	-0.022	-0.017	-0.015	-0.000

D. California - State-Level Regional Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Output Impacts

The annual aggregate output impacts for various years due solely to the proposed critical habitat actions are reported in Table II-15-CA-1. The total annual impacts range from a positive $0.9 million in 1995 to $54.4 million in 2020. The cumulative impacts are reported in Table II-15-CA-2 in present value terms for various discount rates. The present value of the cumulative impacts over the entire study period amounts to a positive $262.6 million at a 3 percent discount rate ($166.3 million at 5 percent). The aggregate output impacts grow steadily over time through the study period.

The sectoral output impacts follow the same pattern as that reported in Chapter II-11 for the total (listing plus critical habitat) impacts. This is to be expected, given the method of computing the impacts solely attributable to the actions taken under the proposed critical habitat designation. Thus, the largest impacts occur in the agriculture sectors (other crops, livestock feed, and miscellaneous agriculture). This finding is consistent with the results presented in Chapter II-11.

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-CA-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 1995 approximately 21 jobs are projected to be gained in the California economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 504 jobs gained.

The employment increases in the other crops sector constitute approximately two-thirds of the total jobs gained through the actions taken under the proposed critical habitat designation.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-CA-4. In 1995 the annual aggregate earnings impact is $0.2 million and in 2005 it is $2.0 million.

The present value of the earnings impacts is a positive $44.1 million at a 3 percent discount rate (see Table II-15-CA-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in California is reported in Table II-15-CA-6. In 2000 the annual impact is projected to be $0.1 million. Over the study period the present value of the impacts at a 3 percent discount rate is a positive $7.1 million (see Table II-15-CA-7). Annual impacts in personal income tax are reported in Table II-15-CA-8. The present value of the stream reported in Table II-15-CA-8 at 3 percent discount rate is a positive $11.0 million (see Table II-15-CA-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

As is the case with Arizona, there are two tables reporting summary measures of the regional impacts. Table II-15-CA-10 reports the percentage change of the present values that are calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-CA-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

The aggregate impacts due to the proposed critical habitat for the California economy are positive. Over the study period, the aggregate output is 0.0013 percent higher under the with fish than the without fish scenario with a 3 percent discount rate (Table II-15-CA-10). Total earnings are 0.0006 percent higher, which is consistent with much of the output impacts occurring in lower earning sectors such as the other crops sector.

Table II-15-CA-11 reports that the annualized impacts on the output of the State economy associated with the proposed critical habitat designation is $17.558 million for a 0 percent discount rate. The annualized impact is $13.13 million at a 3 percent discount rate. The annualized value of the earnings impact is $2.205 million at a 3 percent discount rate. In all cases, for California, the impacts are positive.

Table II-15-CA-1. California: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.1	0.1	0.2	0.4
Other Crops	0.0	0.5	2.5	6.8	12.5	20.4	30.2
Livestock Feed	0.0	0.1	0.5	1.3	2.4	3.9	5.8
Misc. Agriculture	0.0	0.0	0.2	0.6	1.1	1.8	2.8
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Petroleum & Gas Production	0.0	0.0	0.1	0.2	0.3	0.5	0.8
New Construction	0.0	0.0	0.1	0.2	0.3	0.5	0.8
Combined Manufacturing	0.0	0.0	0.1	0.3	0.7	1.1	1.6
Food Products	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Wood Products	0.0	0.0	0.0	0.1	0.3	0.4	0.6
Petroleum & Coal Products	0.0	0.0	0.2	0.6	1.1	1.8	2.7
Transp, Comm, & Utilities	0.0	0.0	0.1	0.3	0.5	0.9	1.3
Recreation Services	0.0	0.0	0.1	0.1	0.3	0.4	0.7
Electric Power Production	0.0	0.0	0.0	0.1	0.2	0.3	0.4
Wholesale/Retail Trade	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Finance, Insurance, Real Estate	0.0	0.1	0.3	0.9	1.7	2.8	4.2
Household and Business Services	0.0	0.0	0.1	0.3	0.5	0.9	1.4
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.1	0.1	0.1
TOTAL	0.0	0.9	4.3	12.1	22.3	36.5	54.4

Table II-15-CA-2. California: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	3.7	1.8	1.1	0.4
Other Crops	304.4	147.0	93.2	33.1
Livestock Feed	58.2	28.1	17.8	6.3
Misc. Agriculture	27.4	13.2	8.3	2.9
Non-petroleum Mines	0.5	0.3	0.2	0.1
Petroleum & Gas Production	7.9	3.8	2.4	0.8
New Construction	7.9	3.8	2.4	0.8
Combined Manufacturing	16.1	7.8	4.9	1.7
Food Products	1.3	0.6	0.4	0.1
Wood Products	6.2	3.0	1.9	0.7
Petroleum & Coal Products	27.4	13.2	8.4	3.0
Transp, Comm, & Utilities	12.8	6.2	3.9	1.4
Recreation Services	6.6	3.2	2.0	0.7
Electric Power Production	4.1	2.0	1.3	0.4
Wholesale/Retail Trade	2.9	1.4	0.9	0.3
Finance, Insurance, Real Estate	41.0	19.7	12.5	4.4
Household and Business Services	13.1	6.3	4.0	1.4
Local Amusements	1.2	0.6	0.4	0.1
Health, Education, Social Services	0.5	0.2	0.1	0.0
Government Industries	1.3	0.6	0.4	0.1
TOTAL	544.3	262.6	166.3	58.9

Table II-15-CA-3. California: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.074	0.342	0.957	1.759	2.879	4.262
Other Crops	0.000	15.830	72.920	203.008	372.277	608.801	900.917
Livestock Feed	0.000	0.950	4.396	12.216	22.422	36.683	54.296
Misc. Agriculture	0.000	1.950	9.175	26.115	48.943	81.632	124.075
Non-petroleum Mines	0.000	0.010	0.048	0.135	0.249	0.408	0.611
Petroleum & Gas Production	0.000	0.025	0.114	0.318	0.586	0.969	1.457
New Construction	0.000	0.128	0.612	1.730	3.227	5.372	8.152
Combined Manufacturing	0.000	0.360	1.403	4.060	7.490	12.335	18.407
Food Products	0.000	0.011	0.046	0.149	0.269	0.439	0.644
Wood Products	0.000	0.126	0.626	1.745	3.247	5.356	8.024
Petroleum & Coal Products	0.000	0.031	0.146	0.405	0.747	1.214	1.793
Transp, Comm, & Utilities	0.000	0.258	1.214	3.396	6.357	10.589	16.040
Recreation Services	0.000	0.152	1.038	2.994	5.715	9.504	14.531
Electric Power Production	0.000	0.036	0.166	0.465	0.863	1.433	2.150
Wholesale/Retail Trade	0.000	0.227	1.172	3.234	6.031	10.067	15.088
Finance, Insurance, Real Estate	0.000	0.460	2.134	6.039	11.229	18.645	28.073
Household and Business Services	0.000	0.416	1.824	5.153	9.550	16.065	24.523
Local Amusements	0.000	0.030	0.131	0.363	0.675	1.119	1.691
Health, Education, Social Services	0.000	0.016	0.085	0.288	0.421	0.709	1.025
Government Industries	0.000	0.108	0.467	1.222	2.355	3.933	6.019
TOTAL	0.000	21.198	98.059	273.994	504.412	828.152	1231.778

Table II-15-CA-4. California: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.1	0.4	1.1	2.0	3.2	4.7
Livestock Feed	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Misc. Agriculture	0.0	0.0	0.1	0.2	0.4	0.6	1.0
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.1
New Construction	0.0	0.0	0.0	0.1	0.1	0.2	0.3
Combined Manufacturing	0.0	0.0	0.0	0.1	0.2	0.4	0.5
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Transp, Comm, & Utilities	0.0	0.0	0.0	0.1	0.2	0.3	0.4
Recreation Services	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.1	0.2	0.4	0.6
Household and Business Services	0.0	0.0	0.0	0.1	0.2	0.3	0.5
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.1	0.1	0.1
TOTAL	0.0	0.2	0.7	2.0	3.7	6.1	9.2

Table II-15-CA-5. California: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	0.2	0.1	0.1	0.0
Other Crops	47.6	23.0	14.6	5.2
Livestock Feed	2.0	0.9	0.6	0.2
Misc. Agriculture	9.3	4.5	2.8	1.0
Non-petroleum Mines	0.1	0.1	0.0	0.0
Petroleum & Gas Production	0.6	0.3	0.2	0.1
New Construction	2.7	1.3	0.8	0.3
Combined Manufacturing	5.3	2.6	1.6	0.6
Food Products	0.2	0.1	0.1	0.0
Wood Products	1.7	0.8	0.5	0.2
Petroleum & Coal Products	1.1	0.5	0.3	0.1
Transp, Comm, & Utilities	4.3	2.1	1.3	0.5
Recreation Services	1.9	0.9	0.6	0.2
Electric Power Production	0.5	0.3	0.2	0.1
Wholesale/Retail Trade	1.3	0.6	0.4	0.1
Finance, Insurance, Real Estate	5.8	2.8	1.8	0.6
Household and Business Services	5.2	2.5	1.6	0.6
Local Amusements	0.3	0.2	0.1	0.0
Health, Education, Social Services	0.2	0.1	0.1	0.0
Government Industries	1.3	0.6	0.4	0.1
TOTAL	91.4	44.1	27.9	9.9

Table II-15-CA-6. California: Indirect Business Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.0	0.1	0.2	0.3	0.4
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Misc. Agriculture	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.1	0.1
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.1	0.2	0.3	0.5
Household and Business Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.1	0.3	0.6	1.0	1.5

Table II-15-CA-7. California: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	0.1	0.0	0.0	0.0
Other Crops	4.3	2.1	1.3	0.5
Livestock Feed	1.1	0.5	0.3	0.1
Misc. Agriculture	0.6	0.3	0.2	0.1
Non-petroleum Mines	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.9	0.4	0.3	0.1
New Construction	0.1	0.0	0.0	0.0
Combined Manufacturing	0.2	0.1	0.1	0.0
Food Products	0.0	0.0	0.0	0.0
Wood Products	0.1	0.0	0.0	0.0
Petroleum & Coal Products	0.7	0.3	0.2	0.1
Transp, Comm, & Utilities	0.6	0.3	0.2	0.1
Recreation Services	0.3	0.1	0.1	0.0
Electric Power Production	0.2	0.1	0.0	0.0
Wholesale/Retail Trade	0.4	0.2	0.1	0.0
Finance, Insurance, Real Estate	5.0	2.4	1.5	0.5
Household and Business Services	0.2	0.1	0.0	0.0
Local Amusements	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0
TOTAL	14.8	7.1	4.5	1.6

Table II-15-CA-8. California: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops	0.0	0.0	0.1	0.3	0.5	0.8	1.2
Livestock Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Misc. Agriculture	0.0	0.0	0.0	0.0	0.1	0.2	0.2
Non-petroleum Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Combined Manufacturing	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Food Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wood Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transp, Comm, & Utilities	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric Power Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale/Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finance, Insurance, Real Estate	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Household and Business Services	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Local Amusements	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health, Education, Social Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Industries	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.2	0.5	0.9	1.5	2.3

Table II-15-CA-9. California: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	0.1	0.0	0.0	0.0
Other Crops	11.9	5.7	3.6	1.3
Livestock Feed	0.5	0.2	0.2	0.1
Misc. Agriculture	2.3	1.1	0.7	0.2
Non-petroleum Mines	0.0	0.0	0.0	0.0
Petroleum & Gas Production	0.1	0.1	0.0	0.0
New Construction	0.7	0.3	0.2	0.1
Combined Manufacturing	1.3	0.6	0.4	0.1
Food Products	0.0	0.0	0.0	0.0
Wood Products	0.4	0.2	0.1	0.0
Petroleum & Coal Products	0.3	0.1	0.1	0.0
Transp, Comm, & Utilities	1.1	0.5	0.3	0.1
Recreation Services	0.5	0.2	0.1	0.1
Electric Power Production	0.1	0.1	0.0	0.0
Wholesale/Retail Trade	0.3	0.2	0.1	0.0
Finance, Insurance, Real Estate	1.4	0.7	0.4	0.2
Household and Business Services	1.3	0.6	0.4	0.1
Local Amusements	0.1	0.0	0.0	0.0
Health, Education, Social Services	0.1	0.0	0.0	0.0
Government Industries	0.3	0.2	0.1	0.0
TOTAL	22.9	11.0	7.0	2.5

Table II-15-CA-10. California: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

	Total Effects			
Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output	0.0016	0.0013	0.0010	0.0006
Earnings	0.0008	0.0006	0.0005	0.0003
Indirect Business Taxes	0.0010	0.0008	0.0007	0.0004
Personal Income Taxes	0.0008	0.0006	0.0005	0.0003

Table II-15-CA-11. California: Annualized Impacts
(Critical Habitat Only)
(1982$ Millions)

	Discount Rates	0.00	0.03	0.05	0.10
Output		17.558	13.130	10.660	6.214
Earnings		2.948	2.205	1.788	1.044
Indirect Business Taxes		0.477	0.355	0.288	0.169
Personal Income Taxes		0.739	0.550	0.449	0.264

E. Colorado - State-Level Regional Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years due to critical habitat are reported in Table II-15-CO-1. The cumulative impacts are reported in Table II-15-CO-2 in present value terms for various discount rates. The annual impacts range from a positive $1.111 million in 1995 to a -$2.369 million in 2020. The largest negative impacts in output are in the livestock feed sector: -$0.237 million in 1995 and increase to -$4.504 million by 2020. The present value of the cumulative impacts over the entire study period amounts to a positive $1.016 million at a 3 percent discount rate ($2.849 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-CO-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 1995 approximately 11 jobs are projected to be gained in the Colorado economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 14 jobs foregone.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-CO-4. In 1995 the annual aggregate earnings impact is a positive $0.437 million and in 2005 it is $0.915 million. The present value of the earnings impacts is a positive $14.774 million at a 3 percent discount rate (see Table II-15-CO-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in Colorado is reported in Table II-15-CO-6. In 1995 the annual impact is projected to be $0.030 million. Over the study period the present value of the impacts at a 3 percent discount rate is a -$0.973 million (see Table II-15-CO-7). Annual impacts in personal income tax are reported in Table II-15-CO-8. The present value of the stream reported in Table II-15-CO-8 at 3 percent discount rate is a positive $3.693 million (see Table II-15-CO-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

As is the case with the preceding States, there are two tables reporting summary measures of the regional impacts. Table II-15-CO-10 reports the percentage change that are calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-CO-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

Because the overall impacts for Colorado are positive in the early part of the study period and negative in the latter part, the present value of the stream of impacts depends on the discount rate chosen. At a 3 percent discount rate, the difference between the without and with fish scenario due to the critical habitat is 0.0 percent (Table II-15-CO-10). The stream of earnings are projected to be 0.002 percent higher under the with fish scenario.

Annualized output impacts are a positive $0.051 million at a 3 percent discount rate (see Table II-15-CO-11) and annualized earnings impacts are a positive $0.739 million. The earnings impacts are higher than the output impacts due to the sectoral distribution of the direct impacts (see Chapter II-10). That is, the output impacts are highest (and negative) for the livestock feed sector, which has relatively low earnings coefficients. Positive output impacts in the construction sector and the combined manufacturing sector offset these earnings losses.

The annualized government revenue impacts are obtained by summing the impacts in the indirect business taxes and the personal income taxes. These total $0.136 million at a 3 percent discount rate. That is, there is a net increase in the total annualized government revenues associated with the impacts due to the proposed critical habitat actions.

Table II-15-CO-1. Colorado: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.015	-0.044	-0.088	-0.133	-0.184	-0.241
Other Crops	0.000	-0.066	-0.196	-0.371	-0.590	-0.846	-1.133
Livestock Feed	0.000	-0.237	-0.705	-1.522	-2.356	-3.320	-4.504
Misc. Agriculture	0.000	-0.003	-0.011	-0.024	-0.040	-0.058	-0.082
Non-petroleum Mines	0.000	0.136	0.336	0.635	0.759	0.889	1.008
Petroleum & Gas Production	0.000	0.248	0.235	0.229	0.326	0.919	0.944
New Construction	0.000	0.644	1.303	1.951	2.610	3.279	3.926
Combined Manufacturing	0.000	0.721	1.447	2.156	2.852	3.466	4.028
Food Products	0.000	-0.015	-0.049	-0.083	-0.117	-0.147	-0.174
Wood Products	0.000	0.013	0.021	0.026	0.033	0.039	0.043
Petroleum & Coal Products	0.000	-0.013	-0.055	-0.138	-0.200	-0.280	-0.316
Transp, Comm, & Utilities	0.000	0.007	-0.019	-0.096	-0.145	-0.224	-0.246
Recreation Services	0.000	-0.211	-0.691	-1.211	-1.733	-2.251	-2.764
Electric Power Production	0.000	-0.194	-0.567	-1.410	-1.863	-2.643	-2.558
Wholesale/Retail Trade	0.000	0.017	0.033	0.045	0.058	0.069	0.077
Finance, Insurance, Real Estate	0.000	0.009	-0.051	-0.165	-0.282	-0.381	-0.555
Household and Business Services	0.000	0.068	0.111	0.137	0.164	0.193	0.214
Local Amusements	0.000	-0.001	-0.003	-0.006	-0.009	-0.012	-0.015
Health, Education, Social Services	0.000	0.001	0.000	-0.001	-0.002	-0.004	-0.005
Government Industries	0.000	0.002	0.001	-0.005	-0.008	-0.012	-0.015
TOTAL	0.000	1.111	1.095	0.059	-0.675	-1.509	-2.369

Table II-15-CO-2. Colorado: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-3.049	-1.542	-1.013	-0.397
Other Crops	-13.772	-6.931	-4.536	-1.768
Livestock Feed	-54.328	-27.267	-17.800	-6.877
Misc. Agriculture	-0.927	-0.460	-0.297	-0.112
Non-petroleum Mines	16.863	8.928	6.051	2.572
Petroleum & Gas Production	12.742	6.711	4.582	2.064
New Construction	61.036	32.383	22.033	9.542
Combined Manufacturing	65.656	35.035	23.928	10.451
Food Products	-2.584	-1.340	-0.895	-0.367
Wood Products	0.793	0.436	0.304	0.141
Petroleum & Coal Products	-4.386	-2.209	-1.442	-0.552
Transp, Comm, & Utilities	-3.123	-1.510	-0.953	-0.325
Recreation Services	-38.885	-20.012	-13.298	-5.378
Electric Power Production	-41.158	-21.074	-13.929	-5.524
Wholesale/Retail Trade	1.349	0.730	0.503	0.225
Finance, Insurance, Real Estate	-6.007	-2.905	-1.837	-0.635
Household and Business Services	4.038	2.234	1.566	0.732
Local Amusements	-0.201	-0.102	-0.067	-0.026
Health, Education, Social Services	-0.048	-0.021	-0.012	-0.002
Government Industries	-0.153	-0.068	-0.039	-0.009
TOTAL EFFECTS	-6.145	1.016	2.849	3.754

Table II-15-CO-3. Colorado: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

INDUSTRIAL SECTORS	1989	Direct and Indirect Impacts 1995	2000	2005	2010	2015	2020
Livestock	0.000	-0.142	-0.429	-0.861	-1.305	-1.804	-2.365
Other Crops	0.000	-1.596	-4.751	-9.029	-14.351	-20.622	-27.617
Livestock Feed	0.000	-2.225	-6.641	-14.339	-22.237	-31.373	-42.557
Misc. Agriculture	0.000	-0.143	-0.506	-1.148	-1.876	-2.753	-3.849
Non-petroleum Mines	0.000	1.417	3.506	6.625	7.934	9.288	10.533
Petroleum & Gas Production	0.000	0.385	0.366	0.357	0.510	1.434	1.473
New Construction	0.000	7.359	14.886	22.287	29.817	37.459	44.856
Combined Manufacturing	0.000	10.011	20.092	29.916	39.609	48.111	55.920
Food Products	0.000	-0.087	-0.281	-0.480	-0.674	-0.847	-1.005
Wood Products	0.000	0.230	0.372	0.478	0.590	0.701	0.786
Petroleum & Coal Products	0.000	-0.020	-0.087	-0.218	-0.315	-0.442	-0.499
Transp, Comm, & Utilities	0.000	0.078	-0.215	-1.095	-1.647	-2.543	-2.797
Recreation Services	0.000	-5.415	-17.688	-30.973	-44.342	-57.568	-70.724
Electric Power Production	0.000	-0.981	-2.874	-7.153	-9.451	-13.407	-12.976
Wholesale/Retail Trade	0.000	0.916	1.726	2.391	3.036	3.629	4.075
Finance, Insurance, Real Estate	0.000	0.071	-0.370	-1.210	-2.076	-2.808	-4.084
Household and Business Services	0.000	1.356	2.208	2.743	3.274	3.850	4.262
Local Amusements	0.000	-0.025	-0.110	-0.221	-0.320	-0.429	-0.516
Health, Education, Social Services	0.000	0.020	0.008	-0.030	-0.067	-0.116	-0.151
Government Industries	0.000	0.108	0.033	-0.210	-0.372	-0.589	-0.712
TOTAL	0.000	11.316	9.244	-2.170	-14.263	-30.829	-47.950

Table II-15-CO-4. Colorado: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

INDUSTRIAL SECTORS	1989	Direct and Indirect Impacts 1995	2000	2005	2010	2015	2020
Livestock	0.000	-0.001	-0.003	-0.005	-0.008	-0.011	-0.014
Other Crops	0.000	-0.005	-0.015	-0.029	-0.046	-0.066	-0.088
Livestock Feed	0.000	-0.008	-0.024	-0.051	-0.079	-0.112	-0.152
Misc. Agriculture	0.000	-0.001	-0.004	-0.010	-0.016	-0.023	-0.033
Non-petroleum Mines	0.000	0.046	0.113	0.214	0.256	0.299	0.340
Petroleum & Gas Production	0.000	0.017	0.017	0.016	0.023	0.065	0.067
New Construction	0.000	0.204	0.412	0.616	0.825	1.036	1.241
Combined Manufacturing	0.000	0.230	0.461	0.686	0.909	1.104	1.283
Food Products	0.000	-0.002	-0.006	-0.011	-0.015	-0.019	-0.022
Wood Products	0.000	0.004	0.006	0.008	0.010	0.012	0.014
Petroleum & Coal Products	0.000	-0.001	-0.002	-0.005	-0.008	-0.011	-0.012
Transp, Comm, & Utilities	0.000	0.002	-0.006	-0.029	-0.044	-0.068	-0.075
Recreation Services	0.000	-0.060	-0.198	-0.346	-0.495	-0.643	-0.790
Electric Power Production	0.000	-0.025	-0.074	-0.185	-0.245	-0.347	-0.336
Wholesale/Retail Trade	0.000	0.008	0.015	0.021	0.027	0.032	0.036
Finance, Insurance, Real Estate	0.000	0.001	-0.007	-0.023	-0.039	-0.053	-0.078
Household and Business Services	0.000	0.027	0.044	0.054	0.065	0.076	0.084
Local Amusements	0.000	0.000	-0.001	-0.002	-0.003	-0.004	-0.005
Health, Education, Social Services	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
Government Industries	0.000	0.002	0.001	-0.004	-0.007	-0.011	-0.014
TOTAL	0.000	0.437	0.728	0.915	1.107	1.253	1.441

Table II-15-CO-5. Colorado: Earnings - Present Value of Critical Habitat Impacts (Critical Habitat Only) (1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 0.00	0.03	0.05	0.10
Livestock	-0.183	-0.093	-0.061	-0.024
Other Crops	-1.067	-0.537	-0.352	-0.137
Livestock Feed	-1.830	-0.919	-0.600	-0.232
Misc. Agriculture	-0.371	-0.184	-0.119	-0.045
Non-petroleum Mines	5.682	3.008	2.039	0.867
Petroleum & Gas Production	0.898	0.473	0.323	0.146
New Construction	19.285	10.231	6.961	3.015
Combined Manufacturing	20.911	11.159	7.621	3.329
Food Products	-0.331	-0.172	-0.115	-0.047
Wood Products	0.247	0.136	0.095	0.044
Petroleum & Coal Products	-0.171	-0.086	-0.056	-0.022
Transp, Comm, & Utilities	-0.950	-0.460	-0.290	-0.099
Recreation Services	-11.108	-5.717	-3.799	-1.536
Electric Power Production	-5.409	-2.770	-1.831	-0.726
Wholesale/Retail Trade	0.622	0.337	0.232	0.104
Finance, Insurance, Real Estate	-0.841	-0.407	-0.257	-0.089
Household and Business Services	1.589	0.879	0.616	0.288
Local Amusements	-0.066	-0.033	-0.022	-0.009
Health, Education, Social Services	-0.023	-0.010	-0.006	-0.001
Government Industries	-0.141	-0.062	-0.036	-0.008
TOTAL EFFECTS	26.740	14.774	10.346	4.818

Table II-15-CO-6. Colorado: Indirect Business Taxes - Incremental Impacts of Critical Habitat (Critical Habitat Only) (1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.000	0.000	-0.001	-0.002	-0.003	-0.004	-0.005
Other Crops	0.000	-0.001	-0.003	-0.006	-0.010	-0.014	-0.019
Livestock Feed	0.000	-0.005	-0.014	-0.029	-0.045	-0.064	-0.087
Misc. Agriculture	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.002
Non-petroleum Mines	0.000	0.009	0.021	0.040	0.048	0.056	0.063
Petroleum & Gas Production	0.000	0.028	0.027	0.026	0.037	0.104	0.107
New Construction	0.000	0.006	0.012	0.018	0.024	0.030	0.036
Combined Manufacturing	0.000	0.008	0.016	0.024	0.031	0.038	0.044
Food Products	0.000	-0.001	-0.003	-0.005	-0.007	-0.009	-0.011
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	-0.001	-0.004	-0.005	-0.007	-0.008
Transp, Comm, & Utilities	0.000	0.000	-0.001	-0.004	-0.007	-0.010	-0.011
Recreation Services	0.000	-0.009	-0.031	-0.054	-0.077	-0.100	-0.122
Electric Power Production	0.000	-0.009	-0.026	-0.066	-0.087	-0.123	-0.119
Wholesale/Retail Trade	0.000	0.003	0.005	0.007	0.008	0.010	0.011
Finance, Insurance, Real Estate	0.000	0.001	-0.006	-0.020	-0.034	-0.045	-0.066
Household and Business Services	0.000	0.001	0.001	0.002	0.002	0.002	0.003
Local Amusements	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.030	-0.005	-0.074	-0.125	-0.138	-0.187

Table II-15-CO-7. Colorado: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.060	-0.031	-0.020	-0.008
Other Crops	-0.234	-0.118	-0.077	-0.030
Livestock Feed	-1.049	-0.527	-0.344	-0.133
Misc. Agriculture	-0.019	-0.010	-0.006	-0.002
Non-petroleum Mines	1.061	0.562	0.381	0.162
Petroleum & Gas Production	1.440	0.759	0.518	0.233
New Construction	0.564	0.299	0.204	0.088
Combined Manufacturing	0.718	0.383	0.262	0.114
Food Products	-0.157	-0.082	-0.055	-0.022
Wood Products	0.009	0.005	0.003	0.002
Petroleum & Coal Products	-0.114	-0.057	-0.037	-0.014
Transp, Comm, & Utilities	-0.145	-0.070	-0.044	-0.015
Recreation Services	-1.721	-0.886	-0.589	-0.238
Electric Power Production	-1.920	-0.983	-0.650	-0.258
Wholesale/Retail Trade	0.199	0.107	0.074	0.033
Finance, Insurance, Real Estate	-0.717	-0.346	-0.219	-0.076
Household and Business Services	0.048	0.026	0.018	0.009
Local Amusements	-0.011	-0.006	-0.004	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL EFFECTS	-2.110	-0.973	-0.584	-0.157

Table II-15-CO-8. Colorado: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	-0.001	-0.001	-0.002	-0.003	-0.004
Other Crops	0.000	-0.001	-0.004	-0.007	-0.011	-0.016	-0.022
Livestock Feed	0.000	-0.002	-0.006	-0.013	-0.020	-0.028	-0.038
Misc. Agriculture	0.000	0.000	-0.001	-0.002	-0.004	-0.006	-0.008
Non-petroleum Mines	0.000	0.011	0.028	0.053	0.064	0.075	0.085
Petroleum & Gas Production	0.000	0.004	0.004	0.004	0.006	0.016	0.017
New Construction	0.000	0.051	0.103	0.154	0.206	0.259	0.310
Combined Manufacturing	0.000	0.057	0.115	0.172	0.227	0.276	0.321
Food Products	0.000	0.000	-0.002	-0.003	-0.004	-0.005	-0.006
Wood Products	0.000	0.001	0.002	0.002	0.003	0.003	0.003
Petroleum & Coal Products	0.000	0.000	-0.001	-0.001	-0.002	-0.003	-0.003
Transp, Comm, & Utilities	0.000	0.001	-0.001	-0.007	-0.011	-0.017	-0.019
Recreation Services	0.000	-0.015	-0.049	-0.086	-0.124	-0.161	-0.197
Electric Power Production	0.000	-0.006	-0.019	-0.046	-0.061	-0.087	-0.084
Wholesale/Retail Trade	0.000	0.002	0.004	0.005	0.007	0.008	0.009
Finance, Insurance, Real Estate	0.000	0.000	-0.002	-0.006	-0.010	-0.013	-0.019
Household and Business Services	0.000	0.007	0.011	0.013	0.016	0.019	0.021
Local Amusements	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Government Industries	0.000	0.001	0.000	-0.001	-0.002	-0.003	-0.003
TOTAL	0.000	0.109	0.182	0.229	0.277	0.313	0.360

Table II-15-CO-9. Colorado: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.046	-0.023	-0.015	-0.006
Other Crops	-0.267	-0.134	-0.088	-0.034
Livestock Feed	-0.458	-0.230	-0.150	-0.058
Misc. Agriculture	-0.093	-0.046	-0.030	-0.011
Non-petroleum Mines	1.420	0.752	0.510	0.217
Petroleum & Gas Production	0.225	0.118	0.081	0.036
New Construction	4.821	2.558	1.740	0.754
Combined Manufacturing	5.228	2.790	1.905	0.832
Food Products	-0.083	-0.043	-0.029	-0.012
Wood Products	0.062	0.034	0.024	0.011
Petroleum & Coal Products	-0.043	-0.022	-0.014	-0.005
Transp, Comm, & Utilities	-0.237	-0.115	-0.072	-0.025
Recreation Services	-2.777	-1.429	-0.950	-0.384
Electric Power Production	-1.352	-0.692	-0.458	-0.182
Wholesale/Retail Trade	0.156	0.084	0.058	0.026
Finance, Insurance, Real Estate	-0.210	-0.102	-0.064	-0.022
Household and Business Services	0.397	0.220	0.154	0.072
Local Amusements	-0.016	-0.008	-0.006	-0.002
Health, Education, Social Services	-0.006	-0.002	-0.001	0.000
Government Industries	-0.035	-0.016	-0.009	-0.002
TOTAL EFFECTS	6.685	3.693	2.586	1.204

Table II-15-CO-10. Colorado: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

	Total Effects			
Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output	-0.0002	0.0000	0.0002	0.0004
Earnings	0.0025	0.0022	0.0020	0.0016
Indirect Business Taxes	-0.0014	-0.0010	-0.0008	-0.0004
Personal Income Taxes	0.0025	0.0022	0.0020	0.0016

Table II-15-CO-11. Colorado: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

	Discount Rates	0.00	0.03	0.05	0.10
Output		-0.198	0.051	0.183	0.396
Earnings		0.826	0.739	0.663	0.508
Indirect Business Taxes		-0.068	-0.049	-0.038	-0.017
Personal Income Taxes		0.216	0.185	0.166	0.127

F. Nevada - State-Level Regional Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years due to critical habitat are reported in Table II-15-NV-1. The cumulative impacts are reported in Table II-15-NV-2 in present value terms for various discount rates. The annual impacts range from $0.0 million in 1995 to -$0.832 million in 2020. The present value of the cumulative impacts over the entire study period amount to -$3.743 million at a 3 percent discount rate (-$2.335 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-NV-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 2000 approximately 1 job is projected to be foregone in the Nevada economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 8 jobs foregone.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-NV-4. In 1995 the annual aggregate earnings impact is $0.0 million and in 2005 it is -$0.068 million. The present value of the earnings impacts is -$1.612 million at a 3 percent discount rate (see Table II-15-NV-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in Nevada is reported in Table II-15-NV-6. In 1995 the annual impact is projected to be $0.0 million. Over the study period the present value of the impacts at a 3 percent discount rate is -$0.237 million (see Table II-15-NV-7). Annual impacts in personal income tax are reported in Table II-15-NV-8. The present value of the stream reported in Table II-15-NV-8 at 3 percent discount rate is -$0.403 million (see Table II-15-NV-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

As is the case with the preceding States, there are two tables reporting summary measures of the regional impacts. Table II-15-NV-10 reports the percentage change that is calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-NV-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

Over the study period, the impacts associated with the proposed critical habitat (the with fish scenario) are negative for Nevada. In Table II-15-NV-10, the cumulative deviations from the without fish scenario are -0.0005 percent of the discounted present value (at 3 percent) for the stream of outputs in the Nevada economy.

The annualized value of the output impact (at a 3 percent discount rate) due to the proposed critical habitat is -$0.187 million. This represents -0.0005 percent of the without fish projected output over the study period (Table II-15-NV-10). The earnings impact is also negative and the annualized value is -$0.080 million. The annualized value of the impact on total government revenues is -$0.032 million at a 3 percent discount rate.

Table II-15-NV-1. Nevada: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Gas Production	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.002
New Construction	0.000	0.000	-0.002	-0.006	-0.013	-0.022	-0.033
Combined Manufacturing	0.000	0.000	-0.001	-0.002	-0.004	-0.006	-0.009
Food Products	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Wood Products	0.000	0.000	0.000	-0.002	-0.003	-0.006	-0.008
Petroleum & Coal Products	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
Transp, Comm, & Utilities	0.000	0.000	-0.004	-0.012	-0.025	-0.042	-0.063
Recreation Services	0.000	0.000	-0.029	-0.101	-0.210	-0.356	-0.537
Electric Power Production	0.000	0.000	-0.002	-0.006	-0.013	-0.022	-0.033
Wholesale/Retail Trade	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.004
Finance, Insurance, Real Estate	0.000	0.000	-0.003	-0.012	-0.024	-0.040	-0.060
Household and Business Services	0.000	0.000	-0.003	-0.011	-0.023	-0.039	-0.060
Local Amusements	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.004
Health, Education, Social Services	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Government Industries	0.000	0.000	0.000	-0.002	-0.003	-0.006	-0.009
TOTAL	0.000	0.000	-0.045	-0.157	-0.327	-0.552	-0.832

Table II-15-NV-2. Nevada: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.010	-0.005	-0.003	-0.001
Other Crops	-0.004	-0.002	-0.001	0.000
Livestock Feed	-0.002	-0.001	-0.001	0.000
Misc. Agriculture	-0.013	-0.006	-0.004	-0.001
Non-petroleum Mines	-0.004	-0.002	-0.001	0.000
Petroleum & Gas Production	-0.022	-0.010	-0.007	-0.002
New Construction	-0.316	-0.150	-0.094	-0.032
Combined Manufacturing	-0.087	-0.041	-0.026	-0.009
Food Products	-0.029	-0.014	-0.008	-0.003
Wood Products	-0.080	-0.038	-0.024	-0.008
Petroleum & Coal Products	-0.021	-0.010	-0.006	-0.002
Transp, Comm, & Utilities	-0.598	-0.283	-0.177	-0.060
Recreation Services	-5.087	-2.409	-1.502	-0.505
Electric Power Production	-0.320	-0.152	-0.095	-0.032
Wholesale/Retail Trade	-0.039	-0.018	-0.011	-0.004
Finance, Insurance, Real Estate	-0.576	-0.273	-0.170	-0.057
Household and Business Services	-0.561	-0.266	-0.166	-0.056
Local Amusements	-0.038	-0.018	-0.011	-0.004
Health, Education, Social Services	-0.013	-0.006	-0.004	-0.001
Government Industries	-0.084	-0.040	-0.025	-0.008
TOTAL EFFECTS	-7.902	-3.743	-2.335	-0.786

Table II-15-NV-3. Nevada: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	-0.001	-0.002	-0.005	-0.008	-0.011
Other Crops	0.000	0.000	-0.001	-0.002	-0.005	-0.008	-0.011
Livestock Feed	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Misc. Agriculture	0.000	0.000	-0.005	-0.018	-0.038	-0.064	-0.097
Non-petroleum Mines	0.000	0.000	0.000	-0.002	-0.002	-0.003	-0.006
Petroleum & Gas Production	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.006
New Construction	0.000	0.000	-0.021	-0.074	-0.154	-0.260	-0.391
Combined Manufacturing	0.000	0.000	-0.006	-0.023	-0.046	-0.078	-0.118
Food Products	0.000	0.000	-0.002	-0.008	-0.017	-0.029	-0.043
Wood Products	0.000	0.000	-0.035	-0.119	-0.246	-0.412	-0.619
Petroleum & Coal Products	0.000	0.000	-0.001	-0.002	-0.004	-0.007	-0.011
Transp, Comm, & Utilities	0.000	0.000	-0.115	-0.391	-0.809	-1.369	-2.059
Recreation Services	0.000	0.000	-0.656	-2.268	-4.720	-7.990	-12.072
Electric Power Production	0.000	0.000	-0.021	-0.070	-0.145	-0.243	-0.363
Wholesale/Retail Trade	0.000	0.000	-0.010	-0.036	-0.066	-0.119	-0.182
Finance, Insurance, Real Estate	0.000	0.000	-0.033	-0.112	-0.232	-0.390	-0.584
Household and Business Services	0.000	0.000	-0.135	-0.459	-0.951	-1.614	-2.463
Local Amusements	0.000	0.000	-0.004	-0.014	-0.028	-0.048	-0.071
Health, Education, Social Services	0.000	0.000	-0.002	-0.004	-0.009	-0.015	-0.023
Government Industries	0.000	0.000	-0.020	-0.068	-0.141	-0.239	-0.362
TOTAL	0.000	0.000	-1.067	-3.676	-7.622	-12.902	-19.494

Table II-15-NV-4. Nevada: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	0.000	-0.001	-0.003	-0.005	-0.009	-0.014
Combined Manufacturing	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Wood Products	0.000	0.000	-0.001	-0.002	-0.004	-0.007	-0.010
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	0.000	-0.003	-0.011	-0.023	-0.039	-0.058
Recreation Services	0.000	0.000	-0.010	-0.034	-0.070	-0.118	-0.178
Electric Power Production	0.000	0.000	-0.001	-0.002	-0.004	-0.008	-0.011
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
Finance, Insurance, Real Estate	0.000	0.000	-0.001	-0.003	-0.005	-0.009	-0.014
Household and Business Services	0.000	0.000	-0.003	-0.010	-0.021	-0.036	-0.055
Local Amusements	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Government Industries	0.000	0.000	0.000	-0.002	-0.003	-0.006	-0.009
TOTAL	0.000	0.000	-0.020	-0.068	-0.140	-0.237	-0.359

Table II-15-NV-5. Nevada: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.001	0.000	0.000	0.000
Other Crops	-0.001	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000
Misc. Agriculture	-0.011	-0.005	-0.003	-0.001
Non-petroleum Mines	-0.002	-0.001	-0.001	0.000
Petroleum & Gas Production	-0.003	-0.001	-0.001	0.000
New Construction	-0.133	-0.063	-0.039	-0.013
Combined Manufacturing	-0.026	-0.012	-0.008	-0.003
Food Products	-0.006	-0.003	-0.002	-0.001
Wood Products	-0.099	-0.047	-0.029	-0.010
Petroleum & Coal Products	-0.003	-0.001	-0.001	0.000
Transp, Comm, & Utilities	-0.552	-0.262	-0.163	-0.055
Recreation Services	-1.689	-0.800	-0.499	-0.168
Electric Power Production	-0.108	-0.051	-0.032	-0.011
Wholesale/Retail Trade	-0.021	-0.010	-0.006	-0.002
Finance, Insurance, Real Estate	-0.130	-0.062	-0.039	-0.013
Household and Business Services	-0.515	-0.244	-0.152	-0.051
Local Amusements	-0.015	-0.007	-0.004	-0.001
Health, Education, Social Services	-0.005	-0.002	-0.001	0.000
Government Industries	-0.083	-0.039	-0.024	-0.008
TOTAL EFFECTS	-3.403	-1.612	-1.006	-0.339

Table II-15-NV-6. Nevada: Indirect Business Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Combined Manufacturing	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.004
Recreation Services	0.000	0.000	-0.002	-0.006	-0.013	-0.022	-0.033
Electric Power Production	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Finance, Insurance, Real Estate	0.000	0.000	-0.001	-0.002	-0.004	-0.007	-0.010
Household and Business Services	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	-0.003	-0.010	-0.021	-0.035	-0.053

Table II-15-NV-7. Nevada: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000
Petroleum & Gas Production	-0.003	-0.002	-0.001	0.000
New Construction	-0.004	-0.002	-0.001	0.000
Combined Manufacturing	-0.001	-0.001	0.000	0.000
Food Products	0.000	0.000	0.000	0.000
Wood Products	-0.001	-0.001	0.000	0.000
Petroleum & Coal Products	-0.001	-0.001	0.000	0.000
Transp, Comm, & Utilities	-0.038	-0.018	-0.011	-0.004
Recreation Services	-0.317	-0.150	-0.094	-0.032
Electric Power Production	-0.019	-0.009	-0.006	-0.002
Wholesale/Retail Trade	-0.007	-0.003	-0.002	-0.001
Finance, Insurance, Real Estate	-0.094	-0.044	-0.028	-0.009
Household and Business Services	-0.009	-0.004	-0.003	-0.001
Local Amusements	-0.003	-0.001	-0.001	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL EFFECTS	-0.500	-0.237	-0.148	-0.050

Table II-15-NV-8. Nevada: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Combined Manufacturing	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.003
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	0.000	-0.001	-0.003	-0.006	-0.010	-0.015
Recreation Services	0.000	0.000	-0.002	-0.008	-0.017	-0.030	-0.045
Electric Power Production	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Finance, Insurance, Real Estate	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Household and Business Services	0.000	0.000	-0.001	-0.003	-0.005	-0.009	-0.014
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002
TOTAL	0.000	0.000	-0.005	-0.017	-0.035	-0.059	-0.090

Table II-15-NV-9. Nevada: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	0.00	0.03	0.05	0.10
Livestock	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	0.000
Misc. Agriculture	-0.003	-0.001	-0.001	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000
Petroleum & Gas Production	-0.001	0.000	0.000	0.000
New Construction	-0.033	-0.016	-0.010	-0.003
Combined Manufacturing	-0.006	-0.003	-0.002	-0.001
Food Products	-0.002	-0.001	0.000	0.000
Wood Products	-0.025	-0.012	-0.007	-0.002
Petroleum & Coal Products	-0.001	0.000	0.000	0.000
Transp, Comm, & Utilities	-0.138	-0.065	-0.041	-0.014
Recreation Services	-0.423	-0.200	-0.125	-0.042
Electric Power Production	-0.027	-0.013	-0.008	-0.003
Wholesale/Retail Trade	-0.005	-0.002	-0.001	0.000
Finance, Insurance, Real Estate	-0.033	-0.015	-0.010	-0.003
Household and Business Services	-0.129	-0.061	-0.038	-0.013
Local Amusements	-0.004	-0.002	-0.001	0.000
Health, Education, Social Services	-0.002	-0.001	0.000	0.000
Government Industries	-0.021	-0.010	-0.006	-0.002
TOTAL EFFECTS	-0.851	-0.403	-0.252	-0.085

Table II-15-NV-10. Nevada: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

	Total Effects			
Discount Rates	0.00	0.03	0.05	0.10
Output	-0.0007	-0.0005	-0.0004	-0.0002
Earnings	-0.0007	-0.0005	-0.0004	-0.0002
Indirect Business Taxes	-0.0006	-0.0005	-0.0004	-0.0002
Personal Income Taxes	-0.0007	-0.0005	-0.0004	-0.0002

Table II-15-NV-11. Nevada: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.255	-0.187	-0.150	-0.083
Earnings	-0.110	-0.080	-0.064	-0.036
Indirect Business Taxes	-0.016	-0.012	-0.009	0.005
Personal Income Taxes	-0.019	-0.020	-0.016	0.009

G. New Mexico - State-Level Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years due to critical habitat are reported in Table II-15-NM-1. The cumulative impacts are reported in Table II-15-NM-2 in present value terms for various discount rates. The annual impacts range from -$.199 million in 1995 to -$13.159 in 2020. The present value of the cumulative impacts over the entire study period amount to -$60.103 million at a 3 percent discount rate (-$37.82 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-NM-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 1995 approximately 2 jobs are projected to be foregone in the New Mexico economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 47 jobs foregone.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines and this is borne out in Table II-15-NM-4. In 1995 the annual aggregate earnings impact is -$0.017 million and in 2005 it is -$0.205 million. The present value of the earnings impacts is -$4.789 million at a 3 percent discount rate (see Table II-15-NM-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in New Mexico is reported in Table II-15-NM-6. In 1995 the annual impact is projected to be -$0.010 million. Over the study period the present value of the impacts at a 3 percent discount rate is -$2.821 million (see Table II-15-NM-7). Annual impacts in personal income tax are reported in Table II-15-NM-8. The present value of the stream reported in Table II-15-NM-8 at 3 percent discount rate is -$1.197 million (see Table II-15-NM-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

As is the case with the preceding States, there are two tables reporting summary measures of the regional impacts. Table II-15-NM-10 reports the percentage change that is calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-NM-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

For the New Mexico economy, the total (listing plus proposed critical habitat) impacts were negative. This is carried over to the impacts associated with the proposed critical habitat designation. Table II-15-NM-10 reports that the present value of the cumulative impact as a percentage of the without fish scenario is -0.0077 percent at a 3 percent discount rate. Earnings are projected to have a negative impact of -0.0021 percent while indirect business taxes are projected to have an impact of -0.0052 percent.

The annualized value of the output impact due to the proposed critical habitat is -$3.005 million (at a 3 percent discount rate). Earnings impacts are projected to be negative and the annualized values of these impacts is -$0.239 million (discount rate is 3 percent). Total government revenues are projected to decline as a result of the proposed critical habitat and the annualized value of this reduction is -$0.201 million (3 percent discount rate).

Table II-15-NM-1. New Mexico: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.006	-0.025	-0.078	-0.155	-0.271	-0.412
Other Crops	0.000	0.000	-0.002	-0.005	-0.010	-0.018	-0.028
Livestock Feed	0.000	-0.117	-0.524	-1.652	-3.290	-5.752	-8.747
Misc. Agriculture	0.000	-0.001	-0.006	-0.020	-0.041	-0.072	-0.114
Non-petroleum Mines	0.000	-0.002	-0.006	-0.017	-0.031	-0.052	-0.078
Petroleum & Gas Production	0.000	-0.013	-0.052	-0.147	-0.282	-0.484	-0.743
New Construction	0.000	-0.004	-0.016	-0.046	-0.090	-0.154	-0.236
Combined Manufacturing	0.000	-0.004	-0.016	-0.050	-0.099	-0.176	-0.277
Food Products	0.000	0.000	-0.002	-0.006	-0.011	-0.020	-0.031
Wood Products	0.000	0.000	-0.001	-0.004	-0.007	-0.013	-0.020
Petroleum & Coal Products	0.000	-0.009	-0.036	-0.105	-0.205	-0.357	-0.556
Transp, Comm, & Utilities	0.000	-0.005	-0.021	-0.059	-0.114	-0.197	-0.303
Recreation Services	0.000	-0.001	-0.005	-0.014	-0.027	-0.048	-0.075
Electric Power Production	0.000	-0.023	-0.075	-0.144	-0.221	-0.313	-0.418
Wholesale/Retail Trade	0.000	-0.001	-0.004	-0.012	-0.024	-0.043	-0.067
Finance, Insurance, Real Estate	0.000	-0.009	-0.042	-0.132	-0.266	-0.470	-0.735
Household and Business Services	0.000	-0.004	-0.016	-0.049	-0.099	-0.175	-0.273
Local Amusements	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.004
Health, Education, Social Services	0.000	0.000	-0.001	-0.002	-0.004	-0.008	-0.012
Government Industries	0.000	0.000	-0.002	-0.005	-0.010	-0.018	-0.028
TOTAL	0.000	-0.199	-0.852	-2.548	-4.989	-8.643	-13.159

Table II-15-NM-2. New Mexico: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-3.909	-1.863	-1.170	-0.404
Other Crops	-0.263	-0.126	-0.079	-0.027
Livestock Feed	-82.979	-39.557	-24.835	-8.577
Misc. Agriculture	-1.048	-0.497	-0.311	-0.107
Non-petroleum Mines	-0.776	-0.375	-0.238	-0.085
Petroleum & Gas Production	-7.125	-3.416	-2.155	-0.756
New Construction	-2.264	-1.085	-0.684	-0.240
Combined Manufacturing	-2.553	-1.214	-0.761	-0.262
Food Products	-0.287	-0.137	-0.086	-0.029
Wood Products	-0.187	-0.089	-0.056	-0.020
Petroleum & Coal Products	-5.228	-2.497	-1.571	-0.546
Transp, Comm, & Utilities	-2.889	-1.383	-0.871	-0.304
Recreation Services	-0.697	-0.332	-0.209	-0.072
Electric Power Production	-5.148	-2.595	-1.700	-0.663
Wholesale/Retail Trade	-0.623	-0.296	-0.186	-0.064
Finance, Insurance, Real Estate	-6.806	-3.236	-2.028	-0.697
Household and Business Services	-2.534	-1.206	-0.756	-0.261
Local Amusements	-0.040	-0.019	-0.012	-0.004
Health, Education, Social Services	-0.111	-0.053	-0.033	-0.011
Government Industries	-0.265	-0.126	-0.079	-0.028
TOTAL EFFECTS	-125.732	-60.103	-37.820	-13.157

Table II-15-NM-3. New Mexico: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.056	-0.250	-0.793	-1.584	-2.773	-4.217
Other Crops	0.000	-0.008	-0.037	-0.118	-0.235	-0.411	-0.625
Livestock Feed	0.000	-1.071	-4.805	-15.136	-30.194	-52.850	-80.369
Misc. Agriculture	0.000	-0.074	-0.338	-1.082	-2.197	-3.909	-6.180
Non-petroleum Mines	0.000	-0.019	-0.076	-0.197	-0.365	-0.610	-0.906
Petroleum & Gas Production	0.000	-0.018	-0.073	-0.207	-0.398	-0.681	-1.047
New Construction	0.000	-0.059	-0.242	-0.686	-1.322	-2.277	-3.488
Combined Manufacturing	0.000	-0.042	-0.186	-0.579	-1.158	-2.046	-3.225
Food Products	0.000	-0.004	-0.016	-0.051	-0.103	-0.183	-0.290
Wood Products	0.000	-0.005	-0.022	-0.065	-0.127	-0.219	-0.339
Petroleum & Coal Products	0.000	-0.006	-0.027	-0.077	-0.151	-0.263	-0.410
Transp, Comm, & Utilities	0.000	-0.046	-0.192	-0.544	-1.057	-1.829	-2.810
Recreation Services	0.000	-0.034	-0.147	-0.438	-0.866	-1.515	-2.370
Electric Power Production	0.000	-0.111	-0.370	-0.707	-1.086	-1.536	-2.054
Wholesale/Retail Trade	0.000	-0.046	-0.215	-0.656	-1.311	-2.314	-3.617
Finance, Insurance, Real Estate	0.000	-0.072	-0.324	-1.015	-2.043	-3.609	-5.648
Household and Business Services	0.000	-0.090	-0.403	-1.241	-2.481	-4.399	-6.854
Local Amusements	0.000	-0.002	-0.010	-0.029	-0.056	-0.098	-0.154
Health, Education, Social Services	0.000	-0.005	-0.021	-0.065	-0.127	-0.223	-0.348
Government Industries	0.000	-0.015	-0.088	-0.257	-0.503	-0.871	-1.388
TOTAL	0.000	-1.783	-7.842	-23.943	-47.364	-82.618	-126.338

Table II-15-NM-4. New Mexico: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	-0.002	-0.005	-0.009	-0.016	-0.025
Other Crops	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Livestock Feed	0.000	-0.004	-0.018	-0.056	-0.111	-0.194	-0.295
Misc. Agriculture	0.000	0.000	-0.002	-0.007	-0.015	-0.026	-0.041
Non-petroleum Mines	0.000	-0.001	-0.002	-0.006	-0.011	-0.019	-0.028
Petroleum & Gas Production	0.000	-0.001	-0.004	-0.010	-0.020	-0.034	-0.052
New Construction	0.000	-0.001	-0.005	-0.014	-0.028	-0.048	-0.073
Combined Manufacturing	0.000	-0.001	-0.004	-0.012	-0.025	-0.044	-0.069
Food Products	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.005
Wood Products	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.006
Petroleum & Coal Products	0.000	0.000	-0.001	-0.004	-0.008	-0.013	-0.021
Transp, Comm, & Utilities	0.000	-0.001	-0.005	-0.014	-0.027	-0.046	-0.071
Recreation Services	0.000	0.000	-0.001	-0.004	-0.008	-0.014	-0.022
Electric Power Production	0.000	-0.003	-0.010	-0.019	-0.029	-0.041	-0.055
Wholesale/Retail Trade	0.000	0.000	-0.002	-0.006	-0.011	-0.020	-0.031
Finance, Insurance, Real Estate	0.000	-0.001	-0.005	-0.017	-0.034	-0.060	-0.095
Household and Business Services	0.000	-0.002	-0.007	-0.021	-0.043	-0.076	-0.118
Local Amusements	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Health, Education, Social Services	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.006
Government Industries	0.000	0.000	-0.002	-0.005	-0.010	-0.017	-0.027
TOTAL	0.000	-0.017	-0.071	-0.205	-0.396	-0.683	-1.045

Table II-15-NM-5. New Mexico: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	0.00	0.03	0.05	0.10
Livestock	-0.237	-0.113	-0.071	-0.025
Other Crops	-0.029	-0.014	-0.009	-0.003
Livestock Feed	-2.796	-1.333	-0.837	-0.289
Misc. Agriculture	-0.379	-0.180	-0.113	-0.039
Non-petroleum Mines	-0.284	-0.137	-0.087	-0.031
Petroleum & Gas Production	-0.502	-0.241	-0.152	-0.053
New Construction	-0.702	-0.337	-0.212	-0.074
Combined Manufacturing	-0.637	-0.303	-0.190	-0.065
Food Products	-0.047	-0.022	-0.014	-0.005
Wood Products	-0.053	-0.025	-0.016	-0.006
Petroleum & Coal Products	-0.194	-0.092	-0.058	-0.020
Transp, Comm, & Utilities	-0.677	-0.324	-0.204	-0.071
Recreation Services	-0.210	-0.100	-0.063	-0.022
Electric Power Production	-0.681	-0.343	-0.225	-0.088
Wholesale/Retail Trade	-0.288	-0.137	-0.086	-0.029
Finance, Insurance, Real Estate	-0.876	-0.417	-0.261	-0.090
Household and Business Services	-1.096	-0.522	-0.327	-0.113
Local Amusements	-0.012	-0.006	-0.004	-0.001
Health, Education, Social Services	-0.053	-0.025	-0.016	-0.005
Government Industries	-0.250	-0.119	-0.075	-0.026
TOTAL EFFECTS	-10.002	-4.789	-3.018	-1.055

Table II-15-NM-6. New Mexico: Indirect Business Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.000	0.000	-0.001	-0.003	-0.006	-0.010	-0.015
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Livestock Feed	0.000	-0.003	-0.015	-0.047	-0.094	-0.164	-0.250
Misc. Agriculture	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.003
Non-petroleum Mines	0.000	0.000	-0.001	-0.001	-0.003	-0.004	-0.006
Petroleum & Gas Production	0.000	-0.002	-0.008	-0.022	-0.041	-0.071	-0.109
New Construction	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.002
Combined Manufacturing	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.004
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	-0.001	-0.002	-0.007	-0.013	-0.023	-0.036
Transp, Comm, & Utilities	0.000	0.000	-0.001	-0.004	-0.007	-0.013	-0.020
Recreation Services	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.005
Electric Power Production	0.000	-0.002	-0.006	-0.011	-0.017	-0.024	-0.032
Wholesale/Retail Trade	0.000	0.000	-0.001	-0.002	-0.004	-0.008	-0.012
Finance, Insurance, Real Estate	0.000	-0.001	-0.007	-0.021	-0.041	-0.073	-0.115
Household and Business Services	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.003
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	-0.010	-0.042	-0.121	-0.234	-0.402	-0.613

Table II-15-NM-7. New Mexico: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.146	-0.070	-0.044	-0.015
Other Crops	-0.005	-0.002	-0.002	-0.001
Livestock Feed	-2.371	-1.131	-0.710	-0.245
Misc. Agriculture	-0.025	-0.012	-0.008	-0.003
Non-petroleum Mines	-0.065	-0.031	-0.020	-0.007
Petroleum & Gas Production	-1.043	-0.500	-0.315	-0.111
New Construction	-0.022	-0.011	-0.007	-0.002
Combined Manufacturing	-0.034	-0.016	-0.010	-0.004
Food Products	-0.002	-0.001	-0.001	0.000
Wood Products	-0.003	-0.001	-0.001	0.000
Petroleum & Coal Products	-0.336	-0.160	-0.101	-0.035
Transp, Comm, & Utilities	-0.186	-0.089	-0.056	-0.020
Recreation Services	-0.045	-0.021	-0.013	-0.005
Electric Power Production	-0.395	-0.199	-0.130	-0.051
Wholesale/Retail Trade	-0.113	-0.054	-0.034	-0.012
Finance, Insurance, Real Estate	-1.060	-0.504	-0.316	-0.109
Household and Business Services	-0.030	-0.014	-0.009	-0.003
Local Amusements	-0.007	-0.003	-0.002	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL EFFECTS	-5.889	-2.821	-1.778	-0.622

Table II-15-NM-8. New Mexico: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.006
Other Crops	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Livestock Feed	0.000	-0.001	-0.004	-0.014	-0.028	-0.048	-0.074
Misc. Agriculture	0.000	0.000	-0.001	-0.002	-0.004	-0.007	-0.010
Non-petroleum Mines	0.000	0.000	-0.001	-0.002	-0.003	-0.005	-0.007
Petroleum & Gas Production	0.000	0.000	-0.001	-0.003	-0.005	-0.009	-0.013
New Construction	0.000	0.000	-0.001	-0.004	-0.007	-0.012	-0.018
Combined Manufacturing	0.000	0.000	-0.001	-0.003	-0.006	-0.011	-0.017
Food Products	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Wood Products	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Petroleum & Coal Products	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.005
Transp, Comm, & Utilities	0.000	0.000	-0.001	-0.003	-0.007	-0.012	-0.018
Recreation Services	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.006
Electric Power Production	0.000	-0.001	-0.002	-0.005	-0.007	-0.010	-0.014
Wholesale/Retail Trade	0.000	0.000	0.000	-0.001	-0.003	-0.005	-0.008
Finance, Insurance, Real Estate	0.000	0.000	-0.001	-0.004	-0.009	-0.015	-0.024
Household and Business Services	0.000	0.000	-0.002	-0.005	-0.011	-0.019	-0.029
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Government Industries	0.000	0.000	0.000	-0.001	-0.002	-0.004	-0.007
TOTAL	0.000	-0.004	-0.018	-0.051	-0.099	-0.171	-0.261

Table II-15-NM-9. New Mexico: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.059	-0.028	-0.018	-0.006
Other Crops	-0.007	-0.003	-0.002	-0.001
Livestock Feed	-0.699	-0.333	-0.209	-0.072
Misc. Agriculture	-0.095	-0.045	-0.028	-0.010
Non-petroleum Mines	-0.071	-0.034	-0.022	-0.008
Petroleum & Gas Production	-0.126	-0.060	-0.038	-0.013
New Construction	-0.175	-0.084	-0.053	-0.019
Combined Manufacturing	-0.159	-0.076	-0.047	-0.016
Food Products	-0.012	-0.006	-0.003	-0.001
Wood Products	-0.013	-0.006	-0.004	-0.001
Petroleum & Coal Products	-0.048	-0.023	-0.015	-0.005
Transp, Comm, & Utilities	-0.169	-0.081	-0.051	-0.018
Recreation Services	-0.052	-0.025	-0.016	-0.005
Electric Power Production	-0.170	-0.086	-0.056	-0.022
Wholesale/Retail Trade	-0.072	-0.034	-0.021	-0.007
Finance, Insurance, Real Estate	-0.219	-0.104	-0.065	-0.022
Household and Business Services	-0.274	-0.130	-0.082	-0.028
Local Amusements	-0.003	-0.001	-0.001	0.000
Health, Education, Social Services	-0.013	-0.006	-0.004	-0.001
Government Industries	-0.063	-0.030	-0.019	-0.007
TOTAL EFFECTS	-2.500	-1.197	-0.754	-0.264

Table II-15-NM-10. New Mexico: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

		Total Effects			
	Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output		-0.0102	-0.0077	-0.0063	-0.0037
Earnings		-0.0028	-0.0021	-0.0018	-0.0010
Indirect Business Taxes		-0.0069	-0.0052	-0.0043	-0.0025
Personal Income Taxes		-0.0028	-0.0021	-0.0018	-0.0010

Table II-15-NM-11. New Mexico: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

Discount Rates	0.00	0.03	0.05	0.10
Output	-4.055	-3.005	-2.424	-1.338
Earnings	-0.322	-0.239	-0.194	-0.111
Indirect Business Taxes	-0.190	-0.141	-0.114	-0.066
Personal Income Taxes	-0.081	-0.060	-0.048	-0.028

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H. Utah - State-Level Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years due to the proposed critical habitat are reported in Table II-15-UT-1. The cumulative impacts are reported in Table II-15-UT-2 in present value terms for various discount rates. The annual impacts range from -$1.719 million in 1995 to -$5.814 in 2020. The present value of the cumulative impacts over the entire study period amounts to -$63.388 million at a 3 percent discount rate (-$44.345 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-UT-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 1995 approximately 22 jobs are projected to be foregone in the Utah economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 73 jobs foregone.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-UT-4. In 1995 the annual aggregate earnings impact is -$0.545 million and in 2005 it is -$1.530 million. The present value of the earnings impacts is -$25.79 million at a 3 percent discount rate (see Table II-15-UT-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in Utah is reported in Table II-15-UT-6. In 1995 the annual impact is projected to be -$0.082 million. Over the study period the present value of the impacts at a 3 percent discount rate is -$3.154 million (see Table II-15-UT-7). Annual impacts in personal income tax are reported in Table II-15-UT-8. The present value of the stream reported in Table II-15-UT-8 at 3 percent discount rate is -$6.447 million (see Table II-15-UT-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

As is the case with the preceding States, there are two tables reporting summary measures of the regional impacts. Table II-15-UT-10 reports the percentage change that is calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-UT-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

Utah is projected to experience negative direct impacts as a result of the proposed critical habitat. The difference between the without fish and the with fish projections is presented in Table II-15-UT-10 in terms of the percentage of the without fish projection over the study period. At a 3 percent discount rate, the impact on output is projected to amount to a -0.0064 percent negative impact. That is, the discounted stream of output in the with fish scenario is projected to be 0.0064 percent below the discounted stream of output in the without fish scenario.

The annualized output impacts are projected to be -$3.169 million (at 3 percent discount rate) due to the proposed critical habitat actions. Earnings impacts are also projected to be negative and the annualized value is -$1.290 million at a 3 percent discount rate. The annualized impacts to government revenues are projected to be -$0.480 million as a result of the proposed critical habitat.

Table II-15-UT-1. Utah: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.035	-0.064	-0.084	-0.091	-0.097	-0.100
Other Crops	0.000	-0.001	-0.003	-0.004	-0.004	-0.005	-0.005
Livestock Feed	0.000	-0.930	-1.663	-2.162	-2.254	-2.300	-2.272
Misc. Agriculture	0.000	-0.005	-0.010	-0.014	-0.015	-0.017	-0.018
Non-petroleum Mines	0.000	0.093	0.233	0.375	0.498	0.612	0.724
Petroleum & Gas Production	0.000	-0.038	-0.068	-0.091	-0.101	-0.112	-0.121
New Construction	0.000	-0.020	-0.038	-0.054	-0.063	-0.074	-0.084
Combined Manufacturing	0.000	-0.094	-0.173	-0.230	-0.249	-0.265	-0.268
Food Products	0.000	-0.021	-0.041	-0.060	-0.079	-0.097	-0.116
Wood Products	0.000	-0.007	-0.014	-0.020	-0.025	-0.029	-0.034
Petroleum & Coal Products	0.000	-0.105	-0.191	-0.256	-0.288	-0.313	-0.332
Transp, Comm, & Utilities	0.000	-0.045	-0.086	-0.119	-0.141	-0.164	-0.187
Recreation Services	0.000	-0.305	-0.636	-0.985	-1.330	-1.671	-2.006
Electric Power Production	0.000	-0.038	-0.069	-0.112	-0.175	-0.273	-0.391
Wholesale/Retail Trade	0.000	-0.007	-0.013	-0.018	-0.021	-0.023	-0.024
Finance, Insurance, Real Estate	0.000	-0.113	-0.214	-0.293	-0.331	-0.362	-0.389
Household and Business Services	0.000	-0.039	-0.074	-0.105	-0.124	-0.143	-0.162
Local Amusements	0.000	-0.002	-0.004	-0.006	-0.008	-0.010	-0.011
Health, Education, Social Services	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002
Government Industries	0.000	-0.004	-0.008	-0.011	-0.013	-0.015	-0.017
TOTAL	0.000	-1.719	-3.135	-4.249	-4.816	-5.358	-5.814

Table II-15-UT-2. Utah: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-2.174	-1.216	-0.857	-0.404
Other Crops	-0.097	-0.053	-0.037	-0.017
Livestock Feed	-53.826	-30.437	-21.603	-10.319
Misc. Agriculture	-0.361	-0.199	-0.139	-0.064
Non-petroleum Mines	11.276	5.937	4.013	1.701
Petroleum & Gas Production	-2.429	-1.348	-0.945	-0.440
New Construction	-1.506	-0.821	-0.570	-0.258
Combined Manufacturing	-5.906	-3.305	-2.330	-1.096
Food Products	-1.849	-0.986	-0.673	-0.294
Wood Products	-0.576	-0.310	-0.213	-0.095
Petroleum & Coal Products	-6.812	-3.783	-2.654	-1.236
Transp, Comm, & Utilities	-3.362	-1.833	-1.271	-0.577
Recreation Services	-30.808	-16.279	-11.042	-4.741
Electric Power Production	-4.525	-2.301	-1.522	-0.618
Wholesale/Retail Trade	-0.489	-0.270	-0.189	-0.087
Finance, Insurance, Real Estate	-7.786	-4.303	-3.009	-1.389
Household and Business Services	-2.930	-1.598	-1.108	-0.502
Local Amusements	-0.181	-0.096	-0.066	-0.029
Health, Education, Social Services	-0.033	-0.019	-0.013	-0.006
Government Industries	-0.308	-0.168	-0.116	-0.053
TOTAL EFFECTS	-114.682	-63.388	-44.345	-20.524

Table II-15-UT-3. Utah: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.427	-0.775	-1.030	-1.123	-1.195	-1.229
Other Crops	0.000	-0.038	-0.071	-0.098	-0.114	-0.129	-0.141
Livestock Feed	0.000	-8.453	-15.152	-19.701	-20.579	-21.021	-20.764
Misc. Agriculture	0.000	-0.248	-0.470	-0.655	-0.736	-0.800	-0.850
Non-petroleum Mines	0.000	0.985	2.466	3.969	5.267	6.479	7.664
Petroleum & Gas Production	0.000	-0.049	-0.089	-0.118	-0.133	-0.146	-0.159
New Construction	0.000	-0.222	-0.418	-0.585	-0.690	-0.802	-0.916
Combined Manufacturing	0.000	-1.124	-2.050	-2.731	-2.955	-3.130	-3.183
Food Products	0.000	-0.176	-0.350	-0.517	-0.675	-0.834	-0.992
Wood Products	0.000	-0.129	-0.254	-0.369	-0.463	-0.550	-0.628
Petroleum & Coal Products	0.000	-0.082	-0.149	-0.200	-0.224	-0.244	-0.258
Transp, Comm, & Utilities	0.000	-0.403	-0.761	-1.058	-1.252	-1.461	-1.666
Recreation Services	0.000	-9.413	-19.617	-30.384	-41.026	-51.536	-61.859
Electric Power Production	0.000	-0.181	-0.323	-0.530	-0.826	-1.287	-1.845
Wholesale/Retail Trade	0.000	-0.392	-0.742	-1.021	-1.153	-1.267	-1.342
Finance, Insurance, Real Estate	0.000	-0.843	-1.594	-2.189	-2.471	-2.699	-2.900
Household and Business Services	0.000	-0.773	-1.477	-2.076	-2.456	-2.833	-3.206
Local Amusements	0.000	-0.062	-0.125	-0.189	-0.245	-0.303	-0.362
Health, Education, Social Services	0.000	-0.015	-0.026	-0.040	-0.038	-0.052	-0.050
Government Industries	0.000	-0.224	-0.410	-0.567	-0.673	-0.785	-0.897
TOTAL	0.000	-22.270	-42.387	-60.089	-72.564	-84.595	-95.583

Table II-15-UT-4. Utah: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.006	-0.012	-0.016	-0.020	-0.024	-0.027
Other Crops	0.000	0.000	-0.001	-0.001	-0.002	-0.002	-0.002
Livestock Feed	0.000	-0.050	-0.094	-0.128	-0.149	-0.166	-0.180
Misc. Agriculture	0.000	-0.003	-0.005	-0.008	-0.009	-0.010	-0.012
Non-petroleum Mines	0.000	0.153	0.380	0.608	0.802	0.984	1.161
Petroleum & Gas Production	0.000	-0.004	-0.008	-0.011	-0.014	-0.017	-0.020
New Construction	0.000	-0.011	-0.022	-0.032	-0.042	-0.053	-0.066
Combined Manufacturing	0.000	-0.039	-0.072	-0.099	-0.116	-0.133	-0.145
Food Products	0.000	-0.020	-0.039	-0.059	-0.078	-0.098	-0.118
Wood Products	0.000	-0.005	-0.010	-0.015	-0.020	-0.025	-0.029
Petroleum & Coal Products	0.000	-0.014	-0.026	-0.038	-0.051	-0.064	-0.077
Transp, Comm, & Utilities	0.000	-0.021	-0.040	-0.059	-0.077	-0.099	-0.122
Recreation Services	0.000	-0.444	-0.927	-1.439	-1.949	-2.454	-2.950
Electric Power Production	0.000	-0.023	-0.041	-0.073	-0.126	-0.211	-0.314
Wholesale/Retail Trade	0.000	-0.005	-0.009	-0.012	-0.015	-0.017	-0.020
Finance, Insurance, Real Estate	0.000	-0.019	-0.037	-0.052	-0.062	-0.072	-0.081
Household and Business Services	0.000	-0.026	-0.050	-0.072	-0.091	-0.111	-0.131
Local Amusements	0.000	-0.003	-0.006	-0.010	-0.013	-0.017	-0.020
Health, Education, Social Services	0.000	0.000	-0.001	-0.001	-0.001	-0.002	-0.002
Government Industries	0.000	-0.004	-0.008	-0.012	-0.014	-0.017	-0.019
TOTAL	0.000	-0.545	-1.028	-1.530	-2.048	-2.606	-3.172

Table II-15-UT-5. Utah: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.473	-0.256	-0.177	-0.079
Other Crops	-0.037	-0.020	-0.014	-0.006
Livestock Feed	-3.501	-1.927	-1.344	-0.618
Misc. Agriculture	-0.213	-0.116	-0.080	-0.036
Non-petroleum Mines	18.198	9.595	6.491	2.757
Petroleum & Gas Production	-0.336	-0.182	-0.125	-0.056
New Construction	-1.006	-0.535	-0.365	-0.159
Combined Manufacturing	-2.746	-1.506	-1.048	-0.479
Food Products	-1.833	-0.973	-0.663	-0.287
Wood Products	-0.464	-0.248	-0.169	-0.074
Petroleum & Coal Products	-1.205	-0.642	-0.438	-0.192
Transp, Comm, & Utilities	-1.852	-0.984	-0.671	-0.293
Recreation Services	-45.139	-23.834	-16.158	-6.929
Electric Power Production	-3.324	-1.655	-1.078	-0.421
Wholesale/Retail Trade	-0.352	-0.191	-0.132	-0.060
Finance, Insurance, Real Estate	-1.459	-0.794	-0.550	-0.249
Household and Business Services	-2.158	-1.159	-0.795	-0.352
Local Amusements	-0.307	-0.162	-0.110	-0.048
Health, Education, Social Services	-0.030	-0.016	-0.011	-0.005
Government Industries	-0.336	-0.182	-0.126	-0.057
TOTAL EFFECTS	-48.572	-25.790	-17.566	-7.641

Table II-15-UT-6. Utah: Indirect Business Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.001	-0.002	-0.002	-0.003	-0.003	-0.003
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	-0.029	-0.051	-0.067	-0.070	-0.071	-0.070
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.007	0.017	0.028	0.037	0.046	0.054
Petroleum & Gas Production	0.000	-0.005	-0.010	-0.013	-0.015	-0.016	-0.017
New Construction	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Combined Manufacturing	0.000	-0.002	-0.003	-0.004	-0.004	-0.004	-0.004
Food Products	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	-0.006	-0.010	-0.014	-0.016	-0.017	-0.018
Transp, Comm, & Utilities	0.000	-0.002	-0.004	-0.005	-0.006	-0.007	-0.009
Recreation Services	0.000	-0.022	-0.045	-0.070	-0.095	-0.119	-0.143
Electric Power Production	0.000	-0.002	-0.004	-0.007	-0.011	-0.017	-0.024
Wholesale/Retail Trade	0.000	-0.001	-0.002	-0.003	-0.004	-0.004	-0.004
Finance, Insurance, Real Estate	0.000	-0.018	-0.034	-0.046	-0.052	-0.057	-0.061
Household and Business Services	0.000	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	-0.082	-0.151	-0.208	-0.242	-0.275	-0.306

Table II-15-UT-7. Utah: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.061	-0.034	-0.024	-0.011
Other Crops	-0.002	-0.001	-0.001	0.000
Livestock Feed	-1.665	-0.942	-0.668	-0.319
Misc. Agriculture	-0.009	-0.005	-0.004	-0.002
Non-petroleum Mines	0.844	0.444	0.300	0.127
Petroleum & Gas Production	-0.350	-0.194	-0.136	-0.063
New Construction	-0.018	-0.010	-0.007	-0.003
Combined Manufacturing	-0.099	-0.055	-0.039	-0.018
Food Products	-0.016	-0.008	-0.006	-0.003
Wood Products	-0.008	-0.004	-0.003	-0.001
Petroleum & Coal Products	-0.372	-0.206	-0.145	-0.067
Transp, Comm, & Utilities	-0.153	-0.083	-0.058	-0.026
Recreation Services	-2.195	-1.160	-0.787	-0.338
Electric Power Production	-0.282	-0.144	-0.095	-0.039
Wholesale/Retail Trade	-0.087	-0.048	-0.034	-0.016
Finance, Insurance, Real Estate	-1.222	-0.675	-0.472	-0.218
Household and Business Services	-0.043	-0.024	-0.016	-0.007
Local Amusements	-0.009	-0.005	-0.003	-0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL EFFECTS	-5.747	-3.154	-2.197	-1.006

Table II-15-UT-8. Utah: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.001	-0.002	-0.002	-0.003	-0.003	-0.003
Other Crops	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Livestock Feed	0.000	-0.012	-0.019	-0.019	-0.007	0.005	0.019
Misc. Agriculture	0.000	-0.001	-0.002	-0.002	-0.003	-0.004	-0.005
Non-petroleum Mines	0.000	0.058	0.143	0.229	0.301	0.369	0.436
Petroleum & Gas Production	0.000	0.006	0.011	0.018	0.029	0.041	0.055
New Construction	0.000	-0.005	-0.010	-0.016	-0.022	-0.031	-0.040
Combined Manufacturing	0.000	-0.010	-0.019	-0.028	-0.037	-0.046	-0.055
Food Products	0.000	-0.009	-0.017	-0.026	-0.035	-0.043	-0.052
Wood Products	0.000	-0.004	-0.007	-0.011	-0.015	-0.018	-0.022
Petroleum & Coal Products	0.000	0.003	0.006	0.011	0.019	0.028	0.038
Transp, Comm, & Utilities	0.000	-0.006	-0.012	-0.018	-0.024	-0.031	-0.039
Recreation Services	0.000	-0.123	-0.257	-0.398	-0.539	-0.679	-0.816
Electric Power Production	0.000	0.000	0.000	0.001	0.004	0.009	0.014
Wholesale/Retail Trade	0.000	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
Finance, Insurance, Real Estate	0.000	0.008	0.018	0.032	0.054	0.077	0.101
Household and Business Services	0.000	-0.014	-0.028	-0.042	-0.057	-0.073	-0.090
Local Amusements	0.000	-0.001	-0.002	-0.004	-0.005	-0.006	-0.008
Health, Education, Social Services	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Government Industries	0.000	-0.004	-0.008	-0.012	-0.016	-0.021	-0.026
TOTAL	0.000	-0.117	-0.207	-0.290	-0.359	-0.429	-0.495

Table II-15-UT-9. Utah: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.118	-0.064	-0.044	-0.020
Other Crops	-0.009	-0.005	-0.003	-0.002
Livestock Feed	-0.875	-0.482	-0.336	-0.154
Misc. Agriculture	-0.053	-0.029	-0.020	-0.009
Non-petroleum Mines	4.550	2.399	1.623	0.689
Petroleum & Gas Production	-0.084	-0.045	-0.031	-0.014
New Construction	-0.251	-0.134	-0.091	-0.040
Combined Manufacturing	-0.686	-0.376	-0.262	-0.120
Food Products	-0.458	-0.243	-0.166	-0.072
Wood Products	-0.116	-0.062	-0.042	-0.018
Petroleum & Coal Products	-0.301	-0.161	-0.110	-0.048
Transp, Comm, & Utilities	-0.463	-0.246	-0.168	-0.073
Recreation Services	-11.285	-5.959	-4.040	-1.732
Electric Power Production	-0.831	-0.414	-0.270	-0.105
Wholesale/Retail Trade	-0.088	-0.048	-0.033	-0.015
Finance, Insurance, Real Estate	-0.365	-0.199	-0.138	-0.062
Household and Business Services	-0.539	-0.290	-0.199	-0.088
Local Amusements	-0.077	-0.041	-0.028	-0.012
Health, Education, Social Services	-0.007	-0.004	-0.003	-0.001
Government Industries	-0.084	-0.046	-0.031	-0.014
TOTAL EFFECTS	-12.142	-6.447	-4.391	-1.910

Table II-15-UT-10. Utah: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

	Total Effects			
Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output	-0.0073	-0.0064	-0.0058	-0.0046
Earnings	-0.0050	-0.0042	-0.0038	-0.0028
Indirect Business Taxes	-0.0072	-0.0063	-0.0057	-0.0044
Personal Income Taxes	-0.0050	-0.0042	-0.0038	-0.0028

Table II-15-UT-11. Utah: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

	Discount Rates	0.00	0.03	0.05	0.10
Output		-3.700	-3.169	-2.843	-2.165
Earnings		-1.568	-1.290	-1.126	-0.806
Indirect Business Taxes		-0.184	-0.158	-0.141	-0.106
Personal Income Taxes		-0.390	-0.322	-0.281	-0.202

I. Wyoming - State-Level Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years due to critical habitat are reported in Table II-15-WY-1. The cumulative impacts are reported in Table II-15-WY-2 in present value terms for various discount rates. The annual impacts range from $0.0 million in 1995 to -$0.286 in 2020. The present value of the cumulative impacts over the entire study period amounts to -$1.997 million at a 3 percent discount rate (-$1.302 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-WY-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 2000 approximately 1 job is projected to be foregone in the Wyoming economy as a result of the proposed critical habitat designation. The figure for the year 2020 is approximately 4 jobs foregone.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-WY-4. In 2000 the annual aggregate earnings impact is -$0.007 million and in 2005 it is -$0.013 million. The present value of the earnings impacts is -$0.207 million at a 3 percent discount rate (see Table II-15-WY-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in Wyoming is reported in Table II-15-WY-6. In 2000 the annual impact is projected to be -$0.003 million. Over the study period the present value of the impacts at a 3 percent discount rate is -$0.087 million (see Table II-15-WY-7). Annual impacts in personal income tax are reported in Table II-15-WY-8. The present value of the stream reported in Table II-15-WY-8 at 3 percent discount rate is -$0.052 million (see Table II-15-WY-9).

5. Summary Measures of Impacts Due to Proposed Critical Habitat

As is the case with the preceding States, there are two tables reporting summary measures of the regional impacts. Table II-15-WY-10 reports the percentage change that is calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-WY-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

For the Wyoming economy, the total (listing plus proposed critical habitat) impacts were negative. This is carried over to the impacts associated with the proposed critical habitat designation. Table II-15-WY-10 reports that the present value of the cumulative impact as a percentage of the without fish scenario is -0.0004 percent at a 3 percent discount rate. Earnings are projected to have a negative impact of -0.0003 percent while indirect business taxes are projected to have an impact of -0.0003 percent.

The annualized value of the output impact due to the proposed critical habitat is -\$0.100 million (at a 3 percent discount rate). Earnings impacts are projected to be negative and the annualized values of these impacts is -\$0.010 million (discount rate is 3 percent). Total government revenues are projected to decline as a result of the proposed critical habitat and the annualized value of this reduction is -\$0.007 million (3 percent discount rate).

Table II-15-WY-1. Wyoming: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	1989	1995	2000	2005	2010	2015	2020
Livestock	0.000	0.000	-0.001	-0.003	-0.004	-0.005	-0.006
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	-0.037	-0.072	-0.106	-0.138	-0.166
Misc. Agriculture	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
Non-petroleum Mines	0.000	0.000	-0.001	0.004	0.004	0.015	0.022
Petroleum & Gas Production	0.000	0.000	-0.003	-0.005	-0.007	-0.009	-0.011
New Construction	0.000	0.000	-0.001	-0.002	-0.003	-0.004	-0.005
Combined Manufacturing	0.000	0.000	-0.002	-0.004	-0.006	-0.008	-0.010
Food Products	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	-0.004	-0.008	-0.011	-0.014	-0.017
Transp, Comm, & Utilities	0.000	0.000	-0.002	-0.004	-0.006	-0.008	-0.009
Recreation Services	0.000	0.000	-0.012	-0.024	-0.037	-0.050	-0.063
Electric Power Production	0.000	0.000	-0.001	-0.002	-0.002	-0.003	-0.003
Wholesale/Retail Trade	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Finance, Insurance, Real Estate	0.000	0.000	-0.002	-0.004	-0.006	-0.009	-0.010
Household and Business Services	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
TOTAL	0.000	0.000	-0.066	-0.126	-0.190	-0.238	-0.286

Table II-15-WY-2. Wyoming: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	0.00	0.03	0.05	0.10
Livestock	-0.084	-0.042	-0.027	-0.010
Other Crops	-0.006	-0.003	-0.002	-0.001
Livestock Feed	-2.265	-1.139	-0.741	-0.279
Misc. Agriculture	-0.028	-0.014	-0.009	-0.003
Non-petroleum Mines	0.179	0.081	0.049	0.015
Petroleum & Gas Production	-0.150	-0.075	-0.049	-0.019
New Construction	-0.063	-0.032	-0.021	-0.008
Combined Manufacturing	-0.135	-0.068	-0.044	-0.017
Food Products	-0.009	-0.005	-0.003	-0.001
Wood Products	-0.002	-0.001	-0.001	0.000
Petroleum & Coal Products	-0.238	-0.120	-0.078	-0.030
Transp, Comm, & Utilities	-0.125	-0.062	-0.041	-0.015
Recreation Services	-0.805	-0.401	-0.260	-0.096
Electric Power Production	-0.047	-0.024	-0.016	-0.006
Wholesale/Retail Trade	-0.019	-0.010	-0.006	-0.002
Finance, Insurance, Real Estate	-0.138	-0.069	-0.045	-0.017
Household and Business Services	-0.017	-0.009	-0.006	-0.002
Local Amusements	-0.001	0.000	0.000	0.000
Health, Education, Social Services	-0.003	-0.002	-0.001	0.000
Government Industries	-0.008	-0.004	-0.003	-0.001
TOTAL EFFECTS	-3.964	-1.997	-1.302	-0.493

Table II-15-WY-3. Wyoming: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	-0.012	-0.023	-0.034	-0.045	-0.054
Other Crops	0.000	0.000	-0.002	-0.004	-0.006	-0.008	-0.009
Livestock Feed	0.000	0.000	-0.309	-0.609	-0.899	-1.168	-1.404
Misc. Agriculture	0.000	0.000	-0.015	-0.030	-0.046	-0.062	-0.078
Non-petroleum Mines	0.000	0.000	-0.005	0.036	0.040	0.139	0.205
Petroleum & Gas Production	0.000	0.000	-0.004	-0.007	-0.010	-0.013	-0.016
New Construction	0.000	0.000	-0.012	-0.023	-0.034	-0.045	-0.055
Combined Manufacturing	0.000	0.000	-0.017	-0.034	-0.051	-0.066	-0.081
Food Products	0.000	0.000	-0.002	-0.004	-0.006	-0.007	-0.009
Wood Products	0.000	0.000	-0.001	-0.001	-0.002	-0.002	-0.002
Petroleum & Coal Products	0.000	0.000	-0.003	-0.006	-0.008	-0.010	-0.012
Transp, Comm, & Utilities	0.000	0.000	-0.014	-0.028	-0.043	-0.054	-0.066
Recreation Services	0.000	0.000	-0.331	-0.685	-1.048	-1.410	-1.768
Electric Power Production	0.000	0.000	-0.004	-0.007	-0.010	-0.013	-0.015
Wholesale/Retail Trade	0.000	0.000	-0.014	-0.026	-0.042	-0.054	-0.068
Finance, Insurance, Real Estate	0.000	0.000	-0.013	-0.026	-0.039	-0.051	-0.063
Household and Business Services	0.000	0.000	-0.003	-0.007	-0.011	-0.013	-0.017
Local Amusements	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
Health, Education, Social Services	0.000	0.000	-0.001	-0.003	-0.004	-0.007	-0.007
Government Industries	0.000	0.000	-0.005	-0.010	-0.016	-0.021	-0.025
TOTAL	0.000	0.000	-0.765	-1.498	-2.272	-2.913	-3.547

Table II-15-WY-4. Wyoming: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	-0.001	-0.002	-0.004	-0.005	-0.006
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Non-petroleum Mines	0.000	0.000	0.000	0.001	0.001	0.005	0.007
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
New Construction	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Combined Manufacturing	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Transp, Comm, & Utilities	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
Recreation Services	0.000	0.000	-0.003	-0.007	-0.011	-0.015	-0.018
Electric Power Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Finance, Insurance, Real Estate	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Household and Business Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
TOTAL	0.000	0.000	-0.007	-0.013	-0.020	-0.024	-0.029

Table II-15-WY-5. Wyoming: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.005	-0.003	-0.002	-0.001
Other Crops	0.000	0.000	0.000	0.000
Livestock Feed	-0.076	-0.038	-0.025	-0.009
Misc. Agriculture	-0.010	-0.005	-0.003	-0.001
Non-petroleum Mines	0.054	0.024	0.015	0.005
Petroleum & Gas Production	-0.011	-0.005	-0.003	-0.001
New Construction	-0.018	-0.009	-0.006	-0.002
Combined Manufacturing	-0.025	-0.012	-0.008	-0.003
Food Products	-0.001	-0.001	0.000	0.000
Wood Products	-0.001	0.000	0.000	0.000
Petroleum & Coal Products	-0.009	-0.004	-0.003	-0.001
Transp, Comm, & Utilities	-0.026	-0.013	-0.009	-0.003
Recreation Services	-0.235	-0.117	-0.076	-0.028
Electric Power Production	-0.006	-0.003	-0.002	-0.001
Wholesale/Retail Trade	-0.009	-0.004	-0.003	-0.001
Finance, Insurance, Real Estate	-0.017	-0.008	-0.005	-0.002
Household and Business Services	-0.005	-0.003	-0.002	-0.001
Local Amusements	0.000	0.000	0.000	0.000
Health, Education, Social Services	-0.002	-0.001	-0.001	0.000
Government Industries	-0.007	-0.004	-0.002	-0.001
TOTAL EFFECTS	-0.409	-0.207	-0.135	-0.052

Table II-15-WY-6. Wyoming: Indirect Business Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	-0.001	-0.002	-0.003	-0.004	-0.005
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Petroleum & Gas Production	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.002
New Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Combined Manufacturing	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001
Transp, Comm, & Utilities	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
Recreation Services	0.000	0.000	-0.001	-0.001	-0.002	-0.003	-0.003
Electric Power Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Finance, Insurance, Real Estate	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.002
Household and Business Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	-0.003	-0.005	-0.008	-0.010	-0.012

Table II-15-WY-7. Wyoming: Indirect Business Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

INDUSTRIAL SECTORS	Direct and Indirect Impacts 0.00	0.03	0.05	0.10
Livestock	-0.003	-0.001	-0.001	0.000
Other Crops	0.000	0.000	0.000	0.000
Livestock Feed	-0.063	-0.032	-0.021	-0.008
Misc. Agriculture	-0.001	0.000	0.000	0.000
Non-petroleum Mines	0.012	0.006	0.003	0.001
Petroleum & Gas Production	-0.022	-0.011	-0.007	-0.003
New Construction	0.000	0.000	0.000	0.000
Combined Manufacturing	-0.002	-0.001	-0.001	0.000
Food Products	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000
Petroleum & Coal Products	-0.015	-0.008	-0.005	-0.002
Transp, Comm, & Utilities	-0.007	-0.003	-0.002	-0.001
Recreation Services	-0.043	-0.021	-0.014	-0.005
Electric Power Production	-0.004	-0.002	-0.001	0.000
Wholesale/Retail Trade	-0.003	-0.002	-0.001	0.000
Finance, Insurance, Real Estate	-0.021	-0.010	-0.007	-0.002
Household and Business Services	0.000	0.000	0.000	0.000
Local Amusements	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL EFFECTS	-0.172	-0.087	-0.057	-0.021

Table II-15-WY-8. Wyoming: Personal Income Taxes - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

INDUSTRIAL SECTORS	1989	1995	Direct and Indirect Impacts 2000	2005	2010	2015	2020
Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Livestock Feed	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
Misc. Agriculture	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-petroleum Mines	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Petroleum & Gas Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
New Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Combined Manufacturing	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Food Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transp, Comm, & Utilities	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Recreation Services	0.000	0.000	-0.001	-0.002	-0.003	-0.004	-0.005
Electric Power Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wholesale/Retail Trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Finance, Insurance, Real Estate	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Household and Business Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	-0.002	-0.003	-0.005	-0.006	-0.007

Table II-15-WY-9. Wyoming: Personal Income Taxes - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.001	-0.001	0.000	0.000
Other Crops	0.000	0.000	0.000	0.000
Livestock Feed	-0.019	-0.010	-0.006	-0.002
Misc. Agriculture	-0.002	-0.001	-0.001	0.000
Non-petroleum Mines	0.013	0.006	0.004	0.001
Petroleum & Gas Production	-0.003	-0.001	-0.001	0.000
New Construction	-0.005	-0.002	-0.001	-0.001
Combined Manufacturing	-0.006	-0.003	-0.002	-0.001
Food Products	0.000	0.000	0.000	0.000
Wood Products	0.000	0.000	0.000	0.000
Petroleum & Coal Products	-0.002	-0.001	-0.001	0.000
Transp, Comm, & Utilities	-0.007	-0.003	-0.002	-0.001
Recreation Services	-0.059	-0.029	-0.019	-0.007
Electric Power Production	-0.002	-0.001	-0.001	0.000
Wholesale/Retail Trade	-0.002	-0.001	-0.001	0.000
Finance, Insurance, Real Estate	-0.004	-0.002	-0.001	-0.001
Household and Business Services	-0.001	-0.001	0.000	0.000
Local Amusements	0.000	0.000	0.000	0.000
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	-0.002	-0.001	-0.001	0.000
TOTAL EFFECTS	-0.102	-0.052	-0.034	-0.013

Table II-15-WY-10. Wyoming: Present Value Percentage Change from Without Fish Scenario
(Critical Habitat Only)
(Percentage Change)

	Total Effects			
Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output	-0.0006	-0.0004	-0.0004	-0.0002
Earnings	-0.0003	-0.0003	-0.0002	-0.0001
Indirect Business Taxes	-0.0004	-0.0003	-0.0002	-0.0002
Personal Income Taxes	-0.0003	-0.0003	-0.0002	-0.0001

Table II-15-WY-11. Wyoming: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

Discount Rates	0.00	0.03	0.05	0.10
Output	-0.129	-0.100	-0.083	-0.052
Earnings	-0.013	-0.010	-0.009	-0.005
Indirect Business Taxes	-0.006	-0.004	-0.004	-0.002
Personal Income Taxes	-0.003	-0.003	-0.002	-0.001

J. Colorado Basin Results - Overall Region-Level Economic Impacts

1. Incremental Impacts Due to Critical Habitat: Aggregate Output

The annual aggregate output impacts for various years due to critical habitat are reported in Table II-15-CB-1. The cumulative impacts are reported in Table II-15-CB-2 in present value terms for various discount rates. The annual impacts range from a positive $1.564 million in 1995 to $31.905 million in 2020. The present value of the cumulative impacts over the entire study period amounts to a positive $167.202 million at a 3 percent discount rate ($108.085 million at 5 percent).

2. Incremental Impacts Due to Critical Habitat: Employment Impacts

Table II-15-CB-3 reports the impact on the number of jobs available for the indicated years throughout the study period. For the year 1995 approximately 29 jobs are projected to be gained in the Basin economy as a result of the proposed critical habitat designation. The figure for the year 2010 is approximately 364 jobs gained.

3. Incremental Impacts Due to Critical Habitat: Earnings Impacts

Employment declines are matched by total earnings declines as shown in Table II-15-CB-4. In 1995 the annual aggregate earnings impact is $0.583 million and in 2005 it is $2.584 million. The present value of the earnings impacts is a positive $49.704 million at a 3 percent discount rate (see Table II-15-CB-5).

4. Incremental Impacts Due to Critical Habitat: Fiscal Impacts

Both indirect business taxes and personal income taxes are impacted by critical habitat. The annual impact for the indirect business tax in the Colorado River Basin is reported in Table II-15-CB-6. In 1995 the annual impact is projected to be $0.031 million. Over the study period the present value of the impacts at a 3 percent discount rate is a positive $3.743 million (see Table II-15-CB-7). Annual impacts in personal income tax are reported in Table II-15-CB-8. The present value of the stream reported in Table II-15-CB-8 at 3 percent discount rate is a positive $12.421 million (see Table II-15-CB-9).

5. Summary Measures of Regional-Level Impacts Due to Proposed Critical Habitat

As is the case with the individual States, there are two tables reporting summary measures of the regional impacts. Table II-15-CB-10 reports the percentage change that is calculated as the differences between the without fish projections over the study period and the with fish projections. Table II-15-CB-11 reports the annualized impacts arising from the actions taken under the proposed critical habitat.

The aggregate impacts due to the proposed critical habitat for the Colorado River Basin regional economy are positive. Over the study period, the aggregate output is 0.0006 percent higher under the with fish than the without fish scenario with a 3 percent discount rate (Table II-15-CB-10). Total earnings are 0.0005 percent higher, which is consistent with much of the positive output impacts occurring in lower earning sectors such as the other crops sector. The overall impacts to government revenues are also positive. Personal income taxes are projected to be 0.0005 percent higher in the with fish scenario.

Table II-15-CB-11 reports that the annualized impacts on the output of the State economy, associated with the proposed critical habitat designation at a 0 percent discount rate, is $10.9134 million. The present value of this annualized impact is $8.360 million at a 3 percent discount rate. The annualized value of the earnings impact is $2.485 million at a 3 percent discount rate. The aggregate impacts for the Colorado River Basin regional economy are positive.

Table II-15-CB-1. Colorado River Basin: Output - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.010	-0.030	-0.055	-0.081	-0.103	-0.129
Other Crops	0.000	0.557	2.121	5.823	10.755	17.796	26.699
Livestock Feed	0.000	-0.324	-1.108	-2.645	-4.460	-6.828	-9.766
Misc. Agriculture	0.000	0.036	0.142	0.406	0.772	1.313	2.030
Non-petroleum Mines	0.000	0.246	0.599	1.080	1.448	1.634	1.984
Petroleum & Gas Production	0.000	0.152	0.262	0.626	0.932	1.832	2.125
New Construction	0.000	0.614	1.295	2.026	2.784	3.574	4.410
Combined Manufacturing	0.000	0.755	1.579	2.466	3.400	4.348	5.349
Food Products	0.000	-0.020	-0.053	-0.085	-0.117	-0.149	-0.177
Wood Products	0.000	0.028	0.069	0.141	0.232	0.354	0.514
Petroleum & Coal Products	0.000	-0.024	-0.033	-0.040	0.063	0.173	0.526
Transp, Comm, & Utilities	0.000	0.004	0.016	0.019	0.096	0.159	0.394
Recreation Services	0.000	-0.233	-0.598	-1.008	-1.422	-1.835	-2.245
Electric Power Production	0.000	-0.370	-0.782	-1.618	-2.081	-3.031	-2.934
Wholesale/Retail Trade	0.000	0.025	0.055	0.095	0.142	0.200	0.266
Finance, Insurance, Real Estate	0.000	0.041	0.121	0.336	0.636	1.125	1.715
Household and Business Services	0.000	0.084	0.192	0.336	0.509	0.730	1.009
Local Amusements	0.000	-0.001	0.001	0.005	0.013	0.026	0.046
Health, Education, Social Services	0.000	0.000	0.002	0.006	0.003	0.018	0.023
Government Industries	0.000	0.003	0.007	0.013	0.024	0.038	0.064
TOTAL	0.000	1.564	3.856	7.924	13.651	21.372	31.905

Table II-15-CB-2. Colorado River Basin: Output - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-1.784	-0.916	-0.607	-0.244
Other Crops	265.628	128.232	81.310	28.941
Livestock Feed	-106.287	-52.273	-33.615	-12.456
Misc. Agriculture	19.453	9.333	5.891	2.070
Non-petroleum Mines	31.107	16.363	11.045	4.654
Petroleum & Gas Production	25.471	12.649	8.208	3.147
New Construction	65.001	34.152	23.076	9.817
Combined Manufacturing	79.159	41.611	28.127	11.977
Food Products	-2.661	-1.391	-0.935	-0.391
Wood Products	5.684	2.830	1.839	0.706
Petroleum & Coal Products	2.265	0.850	0.421	0.028
Transp, Comm, & Utilities	2.648	1.216	0.744	0.242
Recreation Services	-32.331	-16.787	-11.235	-4.646
Electric Power Production	-48.400	-25.159	-16.841	-6.957
Wholesale/Retail Trade	3.398	1.740	1.155	0.469
Finance, Insurance, Real Estate	16.459	7.907	4.999	1.770
Household and Business Services	12.324	6.274	4.146	1.667
Local Amusements	0.359	0.164	0.099	0.030
Health, Education, Social Services	0.212	0.101	0.063	0.022
Government Industries	0.624	0.306	0.197	0.074
TOTAL	338.329	167.202	108.085	40.919

Table II-15-CB-3. Colorado River Basin: Employment - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(Number of Persons)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.112	-0.325	-0.609	-0.874	-1.137	-1.410
Other Crops	0.000	15.642	59.456	163.929	302.457	501.003	751.617
Livestock Feed	0.000	-2.993	-10.256	-24.487	-41.361	-63.386	-90.664
Misc. Agriculture	0.000	1.644	6.418	18.300	34.821	59.253	91.642
Non-petroleum Mines	0.000	2.670	6.508	11.735	15.769	17.783	21.585
Petroleum & Gas Production	0.000	0.237	0.410	0.985	1.467	2.884	3.345
New Construction	0.000	6.623	13.674	21.434	29.609	37.883	46.731
Combined Manufacturing	0.000	8.699	17.998	28.311	39.006	50.013	61.402
Food Products	0.000	-0.106	-0.298	-0.477	-0.669	-0.832	-0.997
Wood Products	0.000	0.386	0.953	1.944	3.193	4.865	7.065
Petroleum & Coal Products	0.000	-0.017	-0.024	-0.029	0.045	0.124	0.375
Transp, Comm, & Utilities	0.000	0.050	0.177	0.217	1.114	1.849	4.601
Recreation Services	0.000	-5.341	-13.732	-23.076	-32.685	-42.276	-51.302
Electric Power Production	0.000	-1.848	-3.912	-8.112	-10.432	-15.183	-14.709
Wholesale/Retail Trade	0.000	1.274	2.836	4.881	7.290	10.227	13.788
Finance, Insurance, Real Estate	0.000	0.263	0.827	2.369	4.431	7.724	11.637
Household and Business Services	0.000	1.684	3.589	6.165	9.544	13.540	18.857
Local Amusements	0.000	-0.010	0.013	0.079	0.214	0.417	0.750
Health, Education, Social Services	0.000	0.000	0.047	0.064	0.219	0.347	0.481
Government Industries	0.000	0.131	0.338	0.590	1.052	1.722	2.891
TOTAL	0.000	28.879	84.698	204.213	364.210	586.821	877.685

Table II-15-CB-4. Colorado River Basin: Earnings - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	-0.001	-0.002	-0.003	-0.005	-0.006	-0.008
Other Crops	0.000	0.083	0.315	0.865	1.597	2.643	3.965
Livestock Feed	0.000	-0.011	-0.037	-0.089	-0.150	-0.230	-0.329
Misc. Agriculture	0.000	0.012	0.049	0.140	0.266	0.452	0.699
Non-petroleum Mines	0.000	0.089	0.216	0.390	0.523	0.590	0.716
Petroleum & Gas Production	0.000	0.011	0.018	0.044	0.066	0.129	0.150
New Construction	0.000	0.204	0.428	0.669	0.920	1.181	1.457
Combined Manufacturing	0.000	0.247	0.509	0.800	1.100	1.411	1.735
Food Products	0.000	-0.003	-0.007	-0.012	-0.016	-0.021	-0.025
Wood Products	0.000	0.008	0.020	0.041	0.066	0.100	0.145
Petroleum & Coal Products	0.000	-0.001	-0.001	-0.002	0.003	0.007	0.021
Transp, Comm, & Utilities	0.000	0.001	0.004	0.006	0.030	0.049	0.123
Recreation Services	0.000	-0.066	-0.173	-0.289	-0.409	-0.530	-0.642
Electric Power Production	0.000	-0.048	-0.102	-0.211	-0.271	-0.395	-0.382
Wholesale/Retail Trade	0.000	0.012	0.025	0.043	0.065	0.092	0.123
Finance, Insurance, Real Estate	0.000	0.007	0.017	0.046	0.088	0.158	0.238
Household and Business Services	0.000	0.035	0.075	0.131	0.199	0.286	0.397
Local Amusements	0.000	0.000	0.000	0.001	0.004	0.008	0.014
Health, Education, Social Services	0.000	0.001	0.002	0.002	0.003	0.006	0.010
Government Industries	0.000	0.003	0.006	0.012	0.022	0.036	0.060
TOTAL	0.000	0.583	1.364	2.584	4.101	5.967	8.468

Table II-15-CB-5. Colorado River Basin: Earnings - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.108	-0.056	-0.037	-0.015
Other Crops	39.445	19.042	12.074	4.298
Livestock Feed	-3.581	-1.761	-1.133	-0.420
Misc. Agriculture	6.696	3.213	2.028	0.712
Non-petroleum Mines	11.236	5.910	3.989	1.680
Petroleum & Gas Production	1.795	0.891	0.578	0.222
New Construction	21.489	11.292	7.631	3.248
Combined Manufacturing	25.668	13.494	9.122	3.886
Food Products	-0.370	-0.193	-0.130	-0.054
Wood Products	1.613	0.804	0.523	0.201
Petroleum & Coal Products	0.091	0.034	0.017	0.001
Transp, Comm, & Utilities	0.821	0.376	0.229	0.074
Recreation Services	-9.290	-4.823	-3.228	-1.334
Electric Power Production	-6.301	-3.275	-2.192	-0.905
Wholesale/Retail Trade	1.556	0.796	0.528	0.214
Finance, Insurance, Real Estate	2.300	1.108	0.702	0.251
Household and Business Services	4.846	2.470	1.634	0.659
Local Amusements	0.107	0.049	0.030	0.009
Health, Education, Social Services	0.099	0.049	0.032	0.013
Government Industries	0.581	0.284	0.183	0.069
TOTAL	98.691	49.704	32.581	12.810

Table II-15-CB-6. Colorado River Basin: Indirect Business Tax - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	-0.001	-0.001	-0.001	-0.002	-0.002
Other Crops	0.000	0.008	0.030	0.083	0.154	0.254	0.381
Livestock Feed	0.000	-0.006	-0.021	-0.051	-0.086	-0.132	-0.189
Misc. Agriculture	0.000	0.001	0.003	0.009	0.016	0.028	0.043
Non-petroleum Mines	0.000	0.014	0.033	0.060	0.081	0.091	0.111
Petroleum & Gas Production	0.000	0.017	0.030	0.071	0.105	0.207	0.240
New Construction	0.000	0.006	0.014	0.021	0.029	0.038	0.046
Combined Manufacturing	0.000	0.008	0.016	0.026	0.035	0.045	0.056
Food Products	0.000	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
Wood Products	0.000	0.000	0.001	0.002	0.003	0.004	0.006
Petroleum & Coal Products	0.000	-0.001	-0.001	-0.001	0.002	0.005	0.014
Transp, Comm, & Utilities	0.000	0.000	0.001	0.001	0.004	0.007	0.018
Recreation Services	0.000	-0.010	-0.027	-0.045	-0.063	-0.082	-0.099
Electric Power Production	0.000	-0.015	-0.032	-0.067	-0.086	-0.125	-0.121
Wholesale/Retail Trade	0.000	0.004	0.009	0.014	0.022	0.030	0.039
Finance, Insurance, Real Estate	0.000	0.006	0.015	0.042	0.078	0.140	0.212
Household and Business Services	0.000	0.001	0.002	0.004	0.006	0.009	0.012
Local Amusements	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.031	0.070	0.165	0.295	0.513	0.762

Table II-15-CB-7. Colorado River Basin: Indirect Business Tax - Present Value of Critical Habitat Impacts
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.032	-0.016	-0.011	-0.004
Other Crops	3.795	1.832	1.162	0.413
Livestock Feed	-2.053	-1.009	-0.649	-0.241
Misc. Agriculture	0.411	0.197	0.124	0.044
Non-petroleum Mines	1.736	0.913	0.616	0.260
Petroleum & Gas Production	2.878	1.429	0.927	0.355
New Construction	0.683	0.359	0.242	0.103
Combined Manufacturing	0.824	0.433	0.293	0.125
Food Products	-0.083	-0.043	-0.029	-0.012
Wood Products	0.065	0.032	0.021	0.008
Petroleum & Coal Products	0.059	0.022	0.011	0.001
Transp, Comm, & Utilities	0.119	0.055	0.033	0.011
Recreation Services	-1.437	-0.746	-0.499	-0.206
Electric Power Production	-1.996	-1.037	-0.694	-0.287
Wholesale/Retail Trade	0.506	0.260	0.172	0.070
Finance, Insurance, Real Estate	2.046	0.985	0.623	0.222
Household and Business Services	0.144	0.073	0.048	0.019
Local Amusements	0.013	0.006	0.003	0.001
Health, Education, Social Services	0.000	0.000	0.000	0.000
Government Industries	0.000	0.000	0.000	0.000
TOTAL	7.679	3.743	2.395	0.882

Table II-15-CB-8. Colorado River Basin: Personal Income Tax - Incremental Impacts of Critical Habitat
(Critical Habitat Only)
(1982$ Millions)

	Direct and Indirect Impacts						
INDUSTRIAL SECTORS	**1989**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
Other Crops	0.000	0.021	0.079	0.216	0.399	0.661	0.991
Livestock Feed	0.000	-0.003	-0.009	-0.022	-0.038	-0.058	-0.082
Misc. Agriculture	0.000	0.003	0.012	0.035	0.066	0.113	0.175
Non-petroleum Mines	0.000	0.022	0.054	0.097	0.131	0.148	0.179
Petroleum & Gas Production	0.000	0.003	0.005	0.011	0.016	0.032	0.037
New Construction	0.000	0.051	0.107	0.167	0.230	0.295	0.364
Combined Manufacturing	0.000	0.062	0.128	0.199	0.275	0.353	0.434
Food Products	0.000	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
Wood Products	0.000	0.002	0.005	0.010	0.016	0.025	0.036
Petroleum & Coal Products	0.000	0.000	0.000	0.000	0.001	0.002	0.005
Transp, Comm, & Utilities	0.000	0.000	0.001	0.002	0.007	0.012	0.031
Recreation Services	0.000	-0.017	-0.043	-0.072	-0.102	-0.132	-0.161
Electric Power Production	0.000	-0.012	-0.025	-0.053	-0.068	-0.099	-0.095
Wholesale/Retail Trade	0.000	0.003	0.006	0.011	0.016	0.023	0.031
Finance, Insurance, Real Estate	0.000	0.002	0.004	0.012	0.022	0.039	0.059
Household and Business Services	0.000	0.009	0.019	0.033	0.050	0.072	0.099
Local Amusements	0.000	0.000	0.000	0.000	0.001	0.002	0.003
Health, Education, Social Services	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Government Industries	0.000	0.001	0.001	0.004	0.006	0.009	0.015
TOTAL	0.000	0.146	0.340	0.645	1.025	1.492	2.116

Table II-15-CB-9. Colorado River Basin: Personal Income Tax - Present Value of Critical Habitat Impacts (Critical Habitat Only) (1982$ Millions)

	Direct and Indirect Impacts			
INDUSTRIAL SECTORS	**0.00**	**0.03**	**0.05**	**0.10**
Livestock	-0.027	-0.014	-0.009	-0.004
Other Crops	9.861	4.761	3.019	1.074
Livestock Feed	-0.895	-0.440	-0.283	-0.105
Misc. Agriculture	1.674	0.803	0.507	0.178
Non-petroleum Mines	2.809	1.477	0.997	0.420
Petroleum & Gas Production	0.449	0.223	0.145	0.055
New Construction	5.372	2.823	1.907	0.812
Combined Manufacturing	6.418	3.374	2.281	0.972
Food Products	-0.093	-0.048	-0.033	-0.014
Wood Products	0.401	0.200	0.130	0.050
Petroleum & Coal Products	0.023	0.009	0.004	0.000
Transp, Comm, & Utilities	0.207	0.095	0.058	0.019
Recreation Services	-2.321	-1.205	-0.806	-0.333
Electric Power Production	-1.575	-0.819	-0.548	-0.226
Wholesale/Retail Trade	0.391	0.200	0.133	0.054
Finance, Insurance, Real Estate	0.575	0.277	0.175	0.063
Household and Business Services	1.211	0.617	0.408	0.164
Local Amusements	0.026	0.012	0.007	0.002
Health, Education, Social Services	0.015	0.007	0.004	0.001
Government Industries	0.143	0.070	0.045	0.017
TOTAL	24.664	12.421	8.141	3.201

Table II-15-CB-10. Colorado River Basin: Present Value Percentage Change from Without Fish Scenario (Critical Habitat Only) (Percentage Change)

	Critical Effects			
Discount Rates	**0.00**	**0.03**	**0.05**	**0.10**
Output	0.0007	0.0006	0.0005	0.0003
Earnings	0.0007	0.0005	0.0005	0.0003
Indirect Business Taxes	0.0004	0.0003	0.0002	0.0002
Personal Income Taxes	0.0007	0.0005	0.0005	0.0003

Table II-15-CB-11. Colorado River Basin: Annualized Impacts
Critical Habitat Only
(1982$ Millions)

Discount Rates	0.00	0.03	0.05	0.10
Output	10.914	8.360	6.923	4.317
Earnings	3.184	2.485	2.088	1.351
Indirect Business Taxes	0.248	0.187	0.154	0.093
Personal Income Taxes	0.796	0.621	0.522	0.338

K. National Efficiency Impacts: Direct Impacts Analysis and Computable General Equilibrium Results

1. Overview

As discussed in Chapter II-13, there are different perspectives available for determining national economic efficiency impacts of proposed critical habitat designation. Evaluating the national economic impacts of the changes in resource allocations for recovering the endangered fishes requires comparing the levels of economic activity before and after this reallocation of resources. An implicit assumption underlying such comparisons is that resource use in the without fish scenario is the highest valued use given available technology and the present allocation of property rights. Further, it is assumed that the economy returns to a new equilibrium after the initial direct impacts have worked through the economy. Thus, the with fish projected allocation of resources is the new highest valued use. These assumptions allow the analyst to compare the total value of the output of the economy before the impacts to the total value of the output after the impacts. The difference is the measure of national economic impacts.[96] Specifically, national efficiency measures are measured as changes in the consumer and producer surplus. These measures capture the net gains and losses resulting from the resource reallocation.

2. Direct Economic Impacts as National Efficiency Effects

Typically, economists have not been able to measure the generalized changes in consumer and producer surplus and thus, approximate approaches have been developed. Traditionally, a value is placed on the output change by utilizing existing prices. This assumes that the value of the direct output given up in designating critical habitat is equal to the cost of the resources necessary to undertake the new activities represented by the reallocation. This procedure utilizing direct impact calculations yields national efficiency impacts as has traditionally been empirically measured.

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[96] The appropriate measure of the cost of resources is their opportunity cost. This is the value of what these resources are capable of producing in their next best use.

Computing national efficiency costs or benefits in the traditional fashion is an acceptable approximation if several assumptions are satisfied. First, to use prices to value the resources displaced by the impact requires that the market for the good in question be free of distortions so that the market price truly reflects the opportunity cost of the resources used to produce that good (Assumption 1). Second, all other markets in the economy must be operating completely free of distortions. That is, the price paid by consumers must be identical to the cost of producing the good for all goods (Assumption 2). Third, the entire national impact must be identical with the regional-level impact (Assumption 3). That is, resources do not flow across regional boundaries.

With these assumptions in mind, an estimate of the national efficiency benefits of the incremental impacts due to the proposed critical habitat is made by determining the value of the direct impacts. This estimate is presented in Table II-15-GE-1 for various years through the study period. For the regional economy, this measure would yield a value of $1.342 million for the impacts in 1995 as a value for the benefits associated with the listing and proposed critical habitat actions in that year. Similarly, the value for the year 2010 is $4.22 million.

Table II-15-GE-2 presents the present value and annualized values. The present value (at a 3 percent discount rate) of the impacts measured by the traditional national efficiency measure based on the data reported in Table II-15-GE-1 is a positive $52.69 million (1982$). The annualized value of these impacts over the study period is $2.63 million.

Table II-15-GE-1. Direct Impacts for the Colorado River Basin

(1982$ Millions)

	Year					
Sector	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
Livestock Feed	-0.318	-0.777	-1.542	-1.871	-2.535	-3.317
Other Crops	0.551	1.558	3.724	5.041	7.440	9.887
Recreation	-0.143	-0.372	-0.409	0.435	-0.461	-0.487
Electric Power	-0.388	-0.412	-0.859	-0.490	-1.015	-0.046
Non-petroleum Mining	0.236	0.339	0.478	0.369	0.594	0.390
Oil and Gas Mining	0.158	0.115	0.364	0.263	0.847	0.176
Construction	0.622	0.635	0.667	0.667	0.667	0.667
Combined Mfg.	0.622	0.635	0.667	0.667	0.667	0.667
Total Direct Impacts	1.342	1.721	3.090	4.215	6.204	7.937

Table II-15-GE-2. Present and Annualized Values of Direct Impacts as National Efficiency Effects

	Discount Rates			
	0%	**3%**	**5%**	**10%**
Present Value	98.82	52.69	37.83	17.46
Annualized Value	3.19	2.63	2.43	1.84

For the purposes of the current analysis of the endangered fishes, assumptions 2 and 3 are arguably not fulfilled.[97] For instance, Assumption 2 relates to the fact that in an integrated economy all markets are more or less interdependent. An exogenous impact in one market will cause responses in other markets through changes in relative prices of the outputs of the markets. If all of the indirectly affected markets in the economy are free of any distortions, then reallocating resources among these markets would generate a series of offsetting effects. An illustration of why markets are not free of distortions can be found in the use of indirect business taxes, which drive a wedge between the price paid by consumers and the cost of producing the good. On the other hand, if these markets are not free of distortions, then the complete accounting of the economic efficiency effects of listing and the proposed critical habitat requires a framework that captures the net effects of adjustments in consumer and producer surplus.

Assumption 3 is also violated for the Colorado River Basin region because there is considerable movement of goods across the boundaries of this region. Thus, it is likely that the impacts reported in Table II-15-GE-1 spill over regional boundaries and affect the economy elsewhere. Although the region comprising the seven States within the Colorado River Basin represents a very extensive economy, there are considerable flows of goods and services between this region and the rest of the U.S. (as well as the rest of the world).

3. National Efficiency Effects: Computable General Equilibrium Results

In Chapter II-13, the national economic impacts of two scenarios (A1 and B1) were presented. The scenarios captured the range of possible direct impacts associated with the construction of new thermal capacity within the Basin. The analysis in this Chapter presents the critical habitat impacts of these scenarios as well as two additional scenarios. The four scenarios are defined as follows:

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[97] It is also likely that Assumption 1 is not fulfilled.

Scenario A1: There exists sufficient underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) that all additions to thermal electric capacity are a net positive addition to the level of national economic activity. The recreation resources within the Basin are unique and the loss of these recreation opportunities cannot be replaced within the U.S. economy.

Scenario A2: There exists sufficient underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) that all additions to thermal electric capacity are a net positive addition to the level of national economic activity. This is ;the same assumption that was made in A1. However, in this scenario, the recreation resources within the Basin are not unique. In particular, it is assumed that foregone recreation opportunities in the Basin can be completely offset through opportunities elsewhere in the U.S. economy. Thus, there are no negative impacts in the recreation sector.

Scenario B1: There is no underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) and all additions to thermal electric capacity within the Basin are constructed with resources that must be displaced from elsewhere in the national economy. Thus, there is no net positive economic impact from this expenditure on thermal expansion. The recreation resources within the Basin are unique and the loss of these recreation opportunities cannot be replaced within the U.S. economy.

Scenario B2: There is no underutilized capacity in the construction and capital equipment sectors (within the Basin or elsewhere in the national economy) and all additions to thermal electric capacity within the Basin are constructed with resources that must be displaced from elsewhere in the national economy. Thus, there is no net positive impact from this expenditure on thermal expansion. However, in this scenario, the recreation resources within the Basin are not unique. In particular, it is assumed that foregone recreation opportunities in the Basin can be completely offset through opportunities elsewhere in the U.S. economy. Thus, there are no negative impacts in the recreation sector.

The CGE model generates two classes of national efficiency effects measures. Each will be discussed in turn, beginning with measures based on conventional national income accounting.

a. CGE Macroeconomic Measures

Table II-15-GE-3 reports the impacts associated with the proposed critical habitat designation in terms of percentage deviation from the without fish scenario. Under Scenario A1 there is an expansion in the national economy and this is reported in Table II-15-GE-3 relative to the level of economic activity in the Colorado River Basin region. Thus, the expansion represents 0.0009 percent of the real gross regional product of the Colorado River Basin region and this expansion would be added to the output of the national economy. Similarly, there are expansions in employment (0.0015 percent above the without fish level), earnings (0.0018 percent), and government revenues (0.007 percent). Under Scenario B1, there are contractions in the national economy and these are also reported relative to the level of activity in the Colorado River Basin regional economy. The contraction represents -0.0008 percent of the real gross regional product of this economy and this would be withdrawn from the national economy. There are similar contractions in employment (-0.0010 percent), earnings (-0.0002 percent), and government revenues (-0.0016 percent). Under Scenario A2 there is a projected expansion of real gross product of 0.0011 percent. There is no discernable expansion or contraction of gross product. For Scenario B2 the change in real gross regional product is effectively zero percent, and earnings increased by 0.0003 percent.

Table II-15-GE-4 reports the results in terms of the dollar levels of activity in the without fish data set. Thus, under Scenario A1, there is a $4.4 million expansion (column 4) in the national economy projected on the basis of the 1982 levels of economic activity. Similarly, there is an increase in employment of 230 jobs and increases in earnings and government revenues. Under Scenario B1, there is a contraction in the national economy of -$3.9 million (column 5). There are 150 jobs foregone. The corresponding figures for Scenario A2 are aggregate output (RGRP) increases by $5.38 million; earnings grow by $5.2 million; and employment increases by 230 jobs and government revenues by $2.06 million. These are national economic impacts. For Scenario B2, these impacts are output increases by $0.09 million; employment increases by 50 jobs; earnings increase by $0.30 million; and government revenues increase by $0.01 million.

Table II-15-GE-3. Colorado River Basin: National Efficiency Results (CGE) (Critical Habitat Only)

(Percentage Deviation from Without Fish Scenario)

Variable	Scenario A1 vs Without Fish	Scenario A2 vs Without Fish	Scenario B1 vs Without Fish	Scenario B2 vs Without Fish
Real Gross Regional Product	0.0009%	0.0011%	-0.0008%	0.0000%
Employment	0.0015%	0.0015%	-0.0010%	0.0003%
Earnings	0.0018%	0.0018%	-0.0002%	0.0001%
Gov't Revenue	0.0007%	0.0009%	-0.0016%	0.0000%

Table II-15-GE-4. Colorado River Basin — National Economic Impacts: Levels and Differences

Variable	Without Fish	With Fish Scenario A1	With Fish Scenario B1	Without Fish vs Scenario A1 With Fish	Without Fish vs Scenario B1 With Fish
Real Gross Regional Product	484213.30	484217.70	484209.40	4.40	-3.90
Employment	15029220.00	15029450.00	15029070.00	230.00	-150.00
Earnings	288907.20	288912.30	288905.50	5.10	-1.70
Gov't Revenue	166249.60	166250.86	166246.90	1.26	-2.70
Variable	**Without Fish**	**With Fish Scenario A2**	**With Fish Scenario B2**	**Without Fish vs Scenario A2 With Fish**	**Without Fish vs Scenario B2 With Fish**
Real Gross Regional Product	484213.30	484218.66	484213.39	5.38	0.09
Employment	15029220.00	1529450.00	15029270.00	230.00	50.00
Earnings	288907.20	288912.40	288907.50	5.20	0.30
Gov't Revenue	166249.60	166251.09	166249.61	2.06	0.01

Scenarios A1, A2, B1, and B2 provide some bounds on the national economic effects associated with the proposed critical habitat designation. The actual outcome will likely lie within these bounds in that some of the construction activity for the thermal electric capacity additions will be a net addition to the national economy as will be the case with the recreation sector.

Table II-15-GE-5a presents the results for output, employment, and earnings across the 19 sectors that appear in the CGE model. These results are presented in terms of percentage deviations from the without fish projection. Under Scenario A1, most sectors are projected to experience some expansion of output, employment, and earnings. The output increases range from 0.000 percent to 0.005 percent. Under Scenario B1 most of the sectors experience negative impacts. Table II-15-GE-5b presents the same set of results for Scenarios A2 and B2. Under Scenario A2, output deviations range from -0.08 percent in electric power to 0.005 percent in recreation services. Under Scenario B2, the output deviations range from -0.0085 percent to 0.0043 percent in other crops.

Tables II-15-GE-6a and II-15-GE-7a report the national economic impacts in terms of the levels of activity in the without fish data set, by sector, and by Scenario (A1 or B1). The results are most clearly shown by focusing on the sectoral changes reported in Table II-15-GE-7a. Under Scenario A1, most sectors expand output and other related activity. The other crops sector, for example, experiences an increase in output of $0.48 million. Output in the combined manufacturing sector is projected to increase by $4.2 million. The total increase in output is $8.27 million. Under Scenario B1, the result is somewhat different. Output in most sectors is projected to decline. Although there are increases in output in several sectors, including construction, combined manufacturing, other crops, and livestock, the total change in output is -$4.76 million.

Tables II-15-GE-6b and II-15-GE-7b report the national economic impacts at sectoral levels for Scenarios A2 and B2. For both of these scenarios the overall impacts are positive although specific sectors record negative impacts. Under Scenario A2 the combined manufacturing sector records the largest increase in output ($4.25 million), employment (59 jobs), and earnings ($1.77 million). The largest decrease occurs in the finance, insurance, and real estate sector.

Under Scenario B2 all impacts are quite small. Discernable negative impacts occur in the petroleum and coal products sector. A noticeable positive impact occurs in the other crops sector.

To conclude, results are most clearly shown by focussing on the sectoral changes reported in Tables II-15-GE-7a and II-15-GE-7b. Under Scenario A1, most sectors expand output and other related activity. The other crops sector, for example, experiences an increase in output of $0.48 million. Output in the combined manufacturing sector is projected to increase by $4.2 million. The total increase in output is $8.27 million. Under Scenario B1, the result is somewhat different. Output in most sectors is projected to decline. Although there are increases in output in several sectors, including construction, combined manufacturing, other crops, and livestock, the total change in output is -$4.76 million. Under Scenario A2 the results are quite similar to A1. Here the overall increase in output is $11.71 million and increase in employment is 229 jobs. Under Scenario B2 there are several offsetting effects at work and the overall impacts across sectors are very small. Total change in industrial output under Scenario B2 is $0.67 million.

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Table II-15-GE-5a. Colorado River Basin - National Economic Sectoral Results
(Critical Habitat Only)
(Percent Deviations With Fish Scenario vs Without Fish Scenarios)

	Scenario A1 vs Without Fish			Scenario B1 vs Without Fish		
Sector	**Output**	**Employment**	**Earnings**	**Output**	**Employment**	**Earnings**
Livestock	0.0043	0.0093	0.0098	0.0109	0.0233	0.0246
Other Crops	0.0050	0.0079	0.0165	0.0021	0.0069	0.0082
Livestock Feed	0.0000	-0.0086	-0.0065	-0.0004	-0.0086	-0.0065
Misc. Agric.	0.0044	0.0065	0.0067	0.0027	0.0042	0.0049
Non-petrol Mine	0.0032	0.0045	0.0045	0.0028	0.0034	0.0044
Petrol/Gas Mine	0.0004	0.0000	0.0007	-0.0001	0.0000	0.0006
Construction	0.0009	0.0011	0.0015	-0.0001	-0.0001	0.0009
Combined Mfg.	0.0026	0.0032	0.0036	0.0006	0.0007	0.0017
Food Products	0.0013	0.0019	0.0025	-0.0012	-0.0022	-0.0011
Wood Products	0.0005	0.0023	0.0027	0.0001	0.0000	0.0011
Petrol/Coal Prods.	-0.0019	-0.0044	-0.0029	-0.0016	-0.0044	-0.0019
Transp/Comm/Util	0.0016	0.0029	0.0032	-0.0002	-0.0002	0.0007
Recreation Services	-0.0005	-0.0007	-0.0003	-0.0008	-0.0010	-0.0001
Electric Power	-0.0009	-0.0029	-0.0025	-0.0005	-0.0015	-0.0005
Wholesale/Retail Trade	0.0013	0.0017	0.0021	-0.0004	-0.0005	0.0004
Finance/Ins.Real Estate	-0.0008	-0.0035	-0.0032	-0.0041	-0.0144	-0.0168
Household/Business Services	0.0013	0.0022	0.0026	-0.0005	-0.0008	0.0002
Local Amusements	0.0016	0.0026	0.0028	-0.0004	-0.0007	0.0003
Health/Education/Public Serv.	0.0006	0.0006	0.0011	-0.0003	-0.0003	0.0007

Table II-15-GE-5b. Colorado River Basin - National Economic Sectoral Results
(Critical Habitat Only)
(Percent Deviations With Fish Scenario vs Without Fish Scenarios)

	Scenario A2 vs Without Fish			Scenario B2 vs Without Fish		
Sector	Output	Employment	Earnings	Output	Employment	Earnings
Livestock	0.0027	0.0056	0.0062	-0.0001	0.0000	-0.0002
Other Crops	0.0046	0.0161	0.0166	0.0043	0.0148	0.0150
Livestock Feed	-0.0042	-0.0773	-0.0772	-0.0009	-0.0172	-0.0162
Misc. Agric.	0.0038	0.0058	0.0057	0.0022	0.0035	0.0031
Non-petrol Mine	0.0035	0.0045	0.0046	-0.0085	0.0056	0.0047
Petrol/Gas Mine	0.0016	0.0102	0.0118	0.0001	0.0000	0.0007
Construction	0.0010	0.0011	0.0013	0.0000	0.0000	0.0000
Combined Mfg.	0.0027	0.0032	0.0035	0.0001	0.0001	0.0000
Food Products	0.0017	0.0028	0.0030	-0.0002	-0.0005	-0.0004
Wood Products	0.0019	0.0026	0.0027	0.0000	0.0000	0.0000
Petrol/Coal Prods.	0.0013	0.0000	0.0026	-0.0014	-0.0044	-0.0025
Transp/Comm/Util	0.0020	0.0034	0.0036	-0.0001	0.0000	-0.0001
Recreation Services	0.0050	0.0006	0.0008	0.0000	0.0000	0.0000
Electric Power	-0.0080	-0.0030	-0.0022	0.0001	0.0000	-0.0002
Wholesale/Retail Trade	0.0014	0.0018	0.0019	0.0000	0.0000	0.0000
Finance/Ins.Real Estate	-0.0008	-0.0035	-0.0034	0.0000	0.0000	0.0000
Household/Business Services	0.0014	0.0024	0.0026	0.0000	0.0001	0.0000
Local Amusements	0.0017	0.0026	0.0027	0.0000	0.0000	0.0000
Health/Education/Public Serv.	0.0006	0.0007	0.0009	0.0000	0.0000	0.0000

Table II-15-GE-6a. Colorado River Basin - National Economic Sectoral Results
(Critical Habitat Only)(1982$ Millions)
(Levels Without Fish Scenario and With Fish Scenarios)

	Without Fish			Scenario A1			Scenario B1		
Sector	**Output**	**Employment**	**Earnings**	**Output**	**Employment**	**Earnings**	**Output**	**Employment**	**Earnings**
Livestock	9620.99	107114	581.93	9621.40	107124	581.99	9622.04	107139	582.07
Other Crops	10486.85	304084	1557.32	10487.33	304132	1557.58	10487.06	304105	1557.45
Livestock Feed	3656.89	34933	123.10	3656.88	34930	123.09	3656.88	34930	123.09
Misc. Agric.	5762.05	260513	1983.39	5762.30	260530	1983.52	4762.21	260524	1983.49
Non-petrol Mine	8135.78	89359	2939.26	8136.04	89363	2939.39	8136.01	89362	2939.39
Petrol/Gas Mine	24720.11	39105	1742.85	24720.12	39105	1742.86	24720.09	39105	1742.86
Construction	71712.79	760159	23707.17	71713.46	760167	23707.52	71712.76	760158	23707.39
Combined Mfg.	160339.21	1842576	51443.78	160343.41	1842635	51445.64	160340.11	1842588	51444.63
Food Products	37737.03	213384	5258.40	37737.52	213388	5258.53	37736.57	213379	5258.34
Wood Products	22336.92	306848	6304.56	22337.30	306855	6304.73	22336.94	306848	6304.63
Petrol/Coal Prods.	31973.62	22792	1284.74	31973.02	22791	1284.70	31973.11	22791	1284.72
Transp/Comm/Util.	44817.38	522517	14012.07	44818.10	522532	14012.52	44817.29	522516	14012.16
Recreation Services	65229.20	1497289	18740.44	65228.85	1497278	18740.39	65228.69	1497274	18740.44
Electric Power	13361.58	66958	1739.45	13361.45	66956	1739.40	13361.52	66957	1739.44
Wholesale/Retail Trade	42917.63	2218631	19792.32	42918.21	2218668	19792.73	42917.44	2218619	19792.40
Finance/Ins./Real Estate	132708.08	909434	18462.51	132706.99	909402	18461.93	132702.71	909273	18459.41
Household/Business Services	76277.02	1422739	29930.76	76278.03	1422770	29931.54	76276.65	1422728	29930.82
Local Amusements	16580.59	272869	4949.46	16580.86	272876	4949.60	16580.52	272867	4949.48
Health/Education/Public Serv.	117585.92	4137917	84353.71	117586.64	4137944	84354.62	117585.61	4137905	84354.31
TOTAL	895959.64	15029221	288907.23	895967.91	15029451	289911.71	895954.88	15029071	289905.91

Table II-15-GE-6b. Colorado River Basin - National Economic Sectoral Results (Critical Habitat Only)(1982$ Millions) (Levels Without Fish Scenario and With Fish Scenarios)

	Without Fish			Scenario A2			Scenario B2		
Sector	**Output**	**Employment**	**Earnings**	**Output**	**Employment**	**Earnings**	**Output**	**Employment**	**Earnings**
Livestock	9620.99	107114	581.93	9621.25	107120	581.96	9620.98	107114	581.93
Other Crops	10486.85	304084	1557.32	10487.34	304133	1557.58	10487.30	304129	1557.56
Livestock Feed	3656.89	34933	123.10	3656.74	34806	123.01	3656.86	34927	123.08
Misc. Agric.	5762.05	260513	1983.39	5762.27	260528	1983.50	5762.17	260522	1983.45
Non-petrol Mine	8135.78	89359	2939.26	8136.07	89363	2939.39	8136.09	89364	2939.40
Petrol/Gas Mine	24720.11	39105	1742.85	24720.50	39109	1743.06	24720.13	39105	1742.86
Construction	71712.79	760159	23707.17	71713.50	760167	23707.49	71712.80	760159	23707.17
Combined Mfg.	160339.21	1842576	51443.78	160343.46	1842635	51445.55	160339.30	1842577	51443.79
Food Products	37737.03	213384	5258.40	37737.67	213390	5258.56	37736.96	213383	5258.38
Wood Products	22336.92	306848	6304.56	22337.34	306856	6304.73	22336.92	306848	6304.56
Petrol/Coal Prods.	31973.62	22792	1284.74	31974.04	22792	1284.77	31973.18	22791	1284.71
Transp/Comm/Util.	44817.38	522517	14012.07	44818.26	522535	14012.58	44817.35	522517	14012.05
Recreation Services	65229.20	1497289	18740.44	65229.50	1497298	18740.59	65229.21	1497289	18740.44
Electric Power	13361.58	66958	1739.45	13361.47	66956	1739.41	13361.59	66958	1739.44
Wholesale/Retail Trade	42917.63	2218631	19792.32	42918.23	2218670	19792.70	42917.63	2218631	19792.31
Finance/Ins./Real Estate	132708.08	909434	18462.51	132707.00	909402	18461.89	132708.07	909434	18462.50
Household/Business Services	76277.02	1422739	29930.76	76278.11	1422773	29931.53	76277.04	1422740	29930.76
Local Amusements	16580.59	272869	4949.46	16580.87	272876	4949.59	16580.59	272869	4949.46
Health/Education/Public Serv.	117585.92	4137917	84353.71	117586.65	4137944	84354.45	117585.91	4137916	84353.67
TOTAL	895959.64	15029221	288907.23	895971.35	15029450	288912.36	895960.31	15029270	288907.51

Table II-15-GE-7a. Colorado River Basin - National Economic Sectoral Results (Critical Habitat Only)(1982$ Millions) (Changes in Levels: With Fish Scenarios vs Without Fish Scenario)

	Scenario A1 vs Without Fish			Scenario B1 vs Without Fish		
Sector	**Output**	**Employment**	**Earnings**	**Output**	**Employment**	**Earnings**
Livestock	0.41	10	0.06	1.05	25	0.14
Other Crops	0.48	48	0.26	0.21	21	0.13
Livestock Feed	-0.01	- 3	-0.01	-0.01	- 3	-0.01
Misc. Agric.	0.25	17	0.13	0.16	11	0.10
Non-petrol Mine	0.26	4	0.13	0.23	3	0.13
Petrol/Gas Mine	0.01	0	0.01	-0.03	0	0.01
Construction	0.67	8	0.35	0.65	- 1	0.22
Combined Mfg.	4.20	59	-0.14	0.90	12	0.85
Food Products	0.49	4	0.13	-0.46	5	-0.06
Wood Products	0.38	7	0.17	0.02	0	0.07
Petrol/Coal Prods.	-0.60	1	-0.04	-0.51	- 1	-0.02
Transp/Comm/Util.	0.72	15	0.45	-0.09	- 1	0.09
Recreation Services	-0.35	11	-0.05	-0.51	-15	0.00
Electric Power	-0.13	- 2	-0.05	-0.06	- 1	-0.01
Wholesale/Retail Trade	0.58	37	0.41	-0.19	-12	0.08
Finance/Insurance/Real Estate	-1.09	32	-0.58	-5.37	-161	-0.10
Household/Business Services	1.01	31	0.78	-0.37	-11	0.06
Local Amusements	0.27	7	0.14	-0.07	- 2	0.02
Health/Education/Public Serv.	0.72	27	0.91	-0.31	-12	0.60
TOTAL	8.27	230	5.1	-4.76	-150	-0.07

Table II-15-GE-7b. Colorado River Basin - National Economic Sectoral Results (Critical Habitat Only)(1982$ Millions) (Changes in Levels: With Fish Scenarios vs Without Fish Scenario)

	Scenario A2 vs Without Fish			Scenario B2 vs Without Fish		
Sector	Output	Employment	Earnings	Output	Employment	Earnings
Livestock	0.26	6	0.03	0.01	0	0.00
Other Crops	0.49	49	0.26	0.26	45	0.26
Livestock Feed	-0.15	-27	-0.09	-0.03	-6	-0.02
Misc. Agric.	0.22	15	0.11	0.12	9	0.06
Non-petrol Mine	0.29	4	0.13	0.31	5	0.14
Petrol/Gas Mine	0.39	4	0.21	0.02	0	0.01
Construction	0.71	8	0.32	0.01	0	0.00
Combined Mfg.	4.25	59	1.77	0.09	1	0.01
Food Products	0.64	6	0.16	-0.07	-1	-0.02
Wood Products	0.42	8	0.17	0.00	0	0.00
Petrol/Coal Prods.	0.42	0	0.03	-0.44	-1	-0.03
Transp/Comm/Util.	0.88	18	0.51	-0.03	0	-0.02
Recreation Services	0.30	9	0.15	0.01	0	0.00
Electric Power	-0.11	-2	-0.04	0.01	0	-0.01
Wholesale/Retail Trade	0.60	39	0.38	0.00	0	-0.01
Finance/Insurance/Real Estate	-1.08	-32	-0.62	-0.01	0	-0.01
Household/Business Services	1.09	34	0.77	0.02	1	0.00
Local Amusements	0.28	7	0.13	0.00	0	0.00
Health/Education/Public Serv.	0.73	27	0.74	-0.01	-1	-0.04
TOTAL	11.71	229	5.13	0.67	49	0.28

If it is assumed that the adjustments to the national economy represented by the CGE results are permanent for each scenario, then it is possible to obtain an estimate of the present value and annualized value.[98] Tables II-15-GE-8a and II-15-GE-8b present these results. Recall that the purpose of analyzing these scenarios was to provide a range of potential values of the national impacts. For output, the discounted present value (3 percent) ranges from $94.30 million for Scenario A2 to -$66.89 million for Scenario B1.

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[98] This approach sets aside the issue of comparing 1982 activity level values with 1995 level values.

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Table II-15-GE-8a. National Economic (CGE): Present and Annualized Values

		Annualized Value (1982 $ millions)				Present Value (1982 $ millions)			
		0%	**3%**	**5%**	**10%**	**0**	**0.03**	**0.05**	**0.1**
Scenario A1	Real Gross Regional Product	4.04	3.77	3.59	3.15	125.40	75.46	55.98	29.85
	Earnings	4.69	4.37	4.16	3.65	145.35	87.47	64.88	34.60
	Gov't Rev.	1.10	1.03	0.98	0.86	34.20	20.58	15.27	8.14
Scenario B1	Real Gross Regional Product	-3.59	-3.34	-3.18	-2.79	-111.15	-66.89	-49.61	-26.46
	Earnings	-0.64	-0.60	-0.57	-0.50	-19.95	-12.01	-8.91	-4.75
	Gov't Rev.	-2.48	-2.32	-2.20	-1.93	-76.95	-46.31	-34.35	-18.32

Table II-15-GE-8b. National Economic (CGE): Present and Annualized Values

		Annualized Value (1982 $ millions)				Present Value (1982 $ millions)			
		0%	**3%**	**5%**	**10%**	**0**	**0.03**	**0.05**	**0.1**
Scenario A2	Real Gross Regional Product	5.12	4.72	4.45	3.89	158.71	94.30	69.52	36.74
	Earnings	5.04	4.64	4.38	3.84	156.35	92.90	68.48	36.19
	Gov't Rev.	1.96	1.81	1.70	1.49	60.77	36.11	26.62	14.07
Scenario B2	Real Gross Regional Product	0.09	0.08	0.07	0.07	2.66	1.58	1.17	0.62
	Earnings	0.29	0.26	0.24	0.22	9.10	5.26	3.88	2.05
	Gov't Rev.	0.01	0.01	0.01	0.01	0.30	0.18	0.13	0.07

b. CGE Surplus Measures

The second class of measures of national efficiency effects that are produced by the CGE models are changes in consumer and producer surplus. Changes in surpluses that are due to the proposed critical habitat are presented for all four scenarios (A1, B1, A2, and B2). The data in Table II-15-GE-9 report the surplus changes. For both A1 and A2 the consumer surplus impacts are positive ($1.95 million and $2.43 million respectively). For B2 the consumer surplus impacts are very near zero. For B1 there is a negative impact in consumer surplus.

Producer surplus impacts are negative for all four scenarios. It was noted in Chapter II-13 that the CGE model incorporates a short run assumption that the stock of capital is fixed within each sector. Thus, producer surplus impacts will generally be negative in the aggregate since capital is unable to move from the sectors that decline as a result of the proposed critical habitat designation. To the extent that capital is able to move across sectors, the producer surplus impacts reported in Table II-15-GE-9 will be an over-estimate of the negative effects due to the proposed critical habitat designation.

Table II-15-GE-9. Changes in Consumer and Producer Surplus (Critical Habitat Only)

	A1 vs without fish	A2 vs without fish	B1 vs without fish	B2 vs without fish
Change in Consumer Surplus	1.95	2.43	-2.59	0.034
Change in Producer Surplus	-0.40	-0.10	-0.50	-0.300
Total Surplus Changes	1.55	2.33	-3.09	-0.266

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